

CMA FINAL · PRACTICAL & NUMERICAL PAPERS · MASTER EDITION

The Complete Practical Papers **Formula Bible**

One unified, exam-ready guide covering all FOUR numerical/practical CMA Final papers — Strategic Financial Management (SFM), Strategic Cost Management (SCM), Strategic Performance Management & Business Valuation (SPMBV), and Corporate Financial Reporting (CFR) — every formula, a dedicated Common Formulas & Cross-Subject Toolkit, and every worked illustration taught using a structured 4-step method: How to Read → Solution Approach → Step-by-Step Solution → Interpretation.

4 Full Subjects, 1 Book

36 Modules Covered

520+ Practice MCQs

51 Illustrations, 4-Step Method

Common Formula Toolkit

Dec 2026 Attempt Ready

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Practical knowledge & hands-on exam preparation for CMA students

ICMAI Syllabus 2022 | Based on official Study Material structure

Table of Contents

How this book is organised: Front matter (How to Use This Book, and a Common Formulas & Cross-Subject Toolkit) comes first, followed by all four subjects in full, each exactly as comprehensive as its own standalone edition — now enhanced so every illustration walks you through *How to Read the Problem*, the *Solution Approach*, the *Step-by-Step Solution*, and finally the *Interpretation* of the answer.

FRONT MATTER

How to Use This Book — The 4-Step Illustration Method

Common Formulas & Cross-Subject Toolkit (Time Value of Money, CAPM/WACC, Variance Logic, Regression, EVA)

5 Illustrations

PART I — STRATEGIC FINANCIAL MANAGEMENT (SFM) · Paper 14

Section A: Investment Decisions (25%) — Modules 1-3

45 MCQs

Section B: Security Analysis & Portfolio Management (35%) — Modules 4-6

45 MCQs

Section C: Financial Risk Management (20%) — Module 7

15 MCQs

Section D: International Financial Management (15%) — Module 8

15 MCQs

Section E: Digital Finance (5%) — Module 9

15 MCQs

PART II — STRATEGIC COST MANAGEMENT (SCM) · Paper 16

Section A: Strategic Cost Management for Decision Making (60%) — Modules 1-5

75 MCQs

Section B: Quantitative Techniques in Decision Making (40%) — Modules 6-10

75 MCQs

PART III — STRATEGIC PERFORMANCE MGMT & BUSINESS VALUATION (SPMBV) · Paper 20A

Section A: Strategic Performance Management (50%) — Modules 1-4

60 MCQs

Section B: Business Valuation (50%) — Modules 5-9

75 MCQs

PART IV — CORPORATE FINANCIAL REPORTING (CFR) · Paper 18

Section A: Indian Accounting Standards (25%) — Module 1

15 MCQs

Section B: Valuation of Shares, Financial Instruments & NBFCs (15%) — Modules 2-4

45 MCQs

Section C: Business Combinations & Restructuring (20%) — Module 5

15 MCQs

Section D: Consolidated & Separate Financial Statements (20%) — Module 6

15 MCQs

Section E: Recent Developments in Financial Reporting (10%) — Module 7

15 MCQs

How to Use This Book — The 4-Step Illustration Method

Every single worked illustration in this book — across all four subjects — follows the same four-part teaching structure. This isn't decoration: it mirrors exactly how a strong candidate should think through an unfamiliar numerical problem under exam conditions, moving from recognition, to strategy, to execution, to meaning. Train yourself to follow these four steps consciously on every practice problem you attempt, not just the ones in this book.

1

How to Read This Problem

Identifies WHAT TYPE of question this is, what the given data is really telling you, and which "signal words" or data patterns point you to the right technique — before you touch a single formula.

2

Solution Approach

Lays out the PLAN — the order in which you'll calculate things and why — including common traps and the sequencing decisions that determine whether your answer will be right or wrong.

3

Step-by-Step Solution

The actual numbered computation, executed exactly as planned in Step 2 — each step shows its formula, its substitution, and its numeric result, so you can follow (and later replicate) the working.

4

Interpretation

Translates the final number back into a business decision or conclusion — accept/reject, undervalued/overvalued, favourable/adverse — because ICMAI exams award marks for correct INTERPRETATION, not just correct arithmetic.

Why this method works for ICMAI exam-level problems

Most students who lose marks on numerical questions don't lose them on arithmetic — they lose them by applying the wrong formula to the right numbers, because they didn't pause to correctly classify the question first. "How to Read" trains that classification instinct. "Solution Approach" prevents the second most common failure: solving the right sub-parts in the wrong order (e.g., trying to compute IRR before NPV, or forgetting that a Yield Value needs an Expected Rate of Return computed first). Finally, "Interpretation" is not optional flourish — ICMAI marking schemes explicitly award marks for stating the decision/conclusion, not just for arriving at the final figure.

How the rest of the book is organised

Immediately after this chapter is a **Common Formulas & Cross-Subject Toolkit** — formulas like the Time Value of Money family, CAPM/WACC, the standard variance-decomposition pattern, EVA, and regression, which recur across two or more of the four subjects. Learn these once, deeply, before you start subject-wise revision — you will meet them again and again. After the toolkit, the book proceeds subject-by-subject (SFM → SCM → SPMBV → CFR), each organised exactly as its official ICMAI syllabus structure, with every module carrying: (1) a complete Formulas section, (2) a Practical Application section explaining when and why to use each formula, (3) fully worked illustrations in the 4-step method above, and (4) 15 exam-style MCQs with full explanations.

A note on currency and rounding: All illustrations use Indian Rupee (₹) figures consistent with ICMAI's exam convention. Minor rounding differences (typically $\pm 0.1\%$) may appear between steps due to intermediate rounding of present value factors, rates, or ratios — this is normal and mirrors what you'll encounter using standard PV tables in the actual exam.

FRONT MATTER

Common Formulas & Cross-Subject Toolkit

Five formula families that recur across two or more of your four practical papers — master these ONCE here, and you'll recognise them instantly wherever they resurface.

Toolkit 1 — Time Value of Money & the DCF Family

Present Value / Future Value

$$PV = FV / (1+r)^n \quad | \quad FV = PV \times (1+r)^n$$

SFM

SPMBV

CFR

The foundation of every DCF, bond, lease, and financial-instrument calculation across all four subjects.

Net Present Value (NPV)

$$NPV = \sum [CF_t / (1+r)^t] - \text{Initial Outlay}$$

SFM

SPMBV

SFM Module 1 (capital budgeting) and SPMBV Module 7 (DCF business valuation) use the EXACT same formula — SPMBV simply calls the outlay/inflows by different names (purchase price vs FCFF).

Terminal Value (Gordon Growth / Perpetuity)

$$\text{Terminal Value} = CF_{(n+1)} / (r - g)$$

SFM

SPMBV

Used identically for equity valuation (SFM Module 4, Gordon Growth Model) and DCF Enterprise Valuation (SPMBV Module 7) — only the cash flow definition changes (dividend vs FCFF).

Right-of-Use Asset / Lease Liability PV (Ind AS 116)

$$\text{Lease Liability} = \text{PV of unpaid lease payments, discounted at the incremental borrowing rate}$$

CFR

SFM

Structurally identical to SFM's Lease-vs-Buy NAL calculation (Module 3) — both discount a stream of lease payments to present value using an appropriate borrowing rate.

Toolkit Illustration 1 — Building a Full DCF (NPV + Terminal Value) in One Flow

A business's projected Free Cash Flow: Year 1 = ₹40 lakh, Year 2 = ₹48 lakh, Year 3 = ₹55 lakh. From Year 4, cash flow grows at a stable 6% p.a. forever. Discount Rate = 14%.

How to Read This Problem: Whenever a question gives you a SHORT explicit forecast (a few years of specific numbers) followed by "growing forever thereafter," you are always looking at a TWO-PART valuation: an explicit-period NPV plus a Terminal Value — never try to discount an infinite stream year-by-year.

Solution Approach: Discount the explicit years normally first. Separately, grow the LAST explicit year's cash flow one more year to get the first "perpetuity" cash flow, apply the Terminal Value formula to get a lump sum AT THE END of the explicit period, then discount that lump sum back the SAME number of years as the explicit period (not one more, not one less). Add the two present values together.

STEP-BY-STEP SOLUTION

Step 1 — PV of explicit cash flows: $PV(Y1)=40/1.14=35.09$; $PV(Y2)=48/1.14^2=36.95$; $PV(Y3)=55/1.14^3=37.13$. Sum = ₹109.17 lakh

Step 2 — Terminal Value at end of Year 3: $CF(\text{Year } 4) = 55 \times 1.06 = 58.30$. $TV = 58.30/(0.14-0.06) = 58.30/0.08 = ₹728.75 \text{ lakh}$

Step 3 — PV of Terminal Value: $728.75/(1.14)^3 = 728.75/1.4815 = ₹491.85 \text{ lakh}$

Step 4 — Total Value: $109.17 + 491.85 = ₹601.02 \text{ lakh}$

Interpretation: The business is valued at approximately ₹6.01 crore. As is typical in DCF valuation, the Terminal Value (₹491.85 lakh PV) dominates the total, representing over 81% of the value — reinforcing why the growth and discount rate assumptions behind Terminal Value deserve the most scrutiny in any DCF exercise, whether you meet it in an SFM capital budgeting context or an SPMBV business valuation context.

Toolkit 2 — Cost of Capital: CAPM & WACC

Capital Asset Pricing Model (CAPM)

$$K_e = R_f + \beta(R_m - R_f)$$

SFM

SPMBV

Used to compute cost of equity for portfolio/security analysis (SFM Module 5) AND as the discount rate input for equity valuation and WACC (SPMBV Modules 5 & 7).

Weighted Average Cost of Capital (WACC)

$$WACC = (E/V) \times K_e + (D/V) \times K_d(1-t)$$

SPMBV

SFM

The universal discount rate for firm-level (Enterprise Value) DCF — feeds directly from CAPM's K_e output plus the after-tax cost of debt.

Toolkit Illustration 2 — From CAPM to WACC in One Continuous Calculation

Risk-free rate = 7%, Market return = 15%, Beta = 1.2. The company's capital structure: Equity (market value) = ₹70 crore, Debt (market value) = ₹30 crore. Pre-tax cost of debt = 11%, Tax rate = 25%.

How to Read This Problem: Whenever a question gives you BOTH a beta/market-return set of inputs AND a capital structure (equity/debt mix), it's testing whether you know CAPM is only step one — the ultimate destination is usually WACC, not K_e alone.

Solution Approach: Compute K_e via CAPM first. Then find the capital structure weights from market values (never book values). Convert the pre-tax cost of debt to after-tax using the tax shield. Finally combine all three into the WACC formula.

STEP-BY-STEP SOLUTION

Step 1 — CAPM (Cost of Equity): $K_e = 7\% + 1.2(15\% - 7\%) = 7\% + 9.6\% = 16.6\%$

Step 2 — Capital structure weights: $V = 70 + 30 = 100$. $E/V = 0.70$; $D/V = 0.30$

Step 3 — After-tax cost of debt: $11\% \times (1 - 0.25) = 8.25\%$

Step 4 — WACC: $(0.70 \times 16.6\%) + (0.30 \times 8.25\%) = 11.62\% + 2.475\% = 14.095\% \approx 14.1\%$

Interpretation: This company's blended cost of capital is 14.1% — this is the rate that should be used to discount Free Cash Flow to Firm in a DCF valuation, and it is meaningfully lower than the standalone cost of equity (16.6%) because debt is cheaper than equity, especially after its tax shield.

Toolkit 3 — Value-Based Performance Metrics: EVA, RI & MVA

Residual Income (RI)

$$\text{RI} = \text{Net Operating Profit} - (\text{Capital Employed} \times \text{Required Rate of Return})$$

SCM

SCM Module 5 (Evaluating Performance) uses RI to fix ROI's dysfunctional incentive problem for divisional managers.

Economic Value Added (EVA)

$$\text{EVA} = \text{NOPAT} - (\text{Capital Employed} \times \text{WACC})$$

SCM

SPMBV

Structurally IDENTICAL to Residual Income — EVA is simply RI computed with specific adjustments (NOPAT instead of accounting profit, WACC instead of a generic hurdle rate). SPMBV Module 8 uses it as evidence of value creation supporting a valuation premium.

Market Value Added (MVA)

$$\text{MVA} = \text{Market Value of the Firm} - \text{Total Capital Invested}$$

SPMBV

The cumulative, market-facing counterpart to EVA's single-period, internal measure.

Toolkit Illustration 3 — RI and EVA are the Same Formula in Different Clothes

A division reports Net Operating Profit (=NOPAT, ignore tax adjustments for simplicity) of ₹60,00,000 on Capital Employed of ₹3,00,00,000. The company's Cost of Capital (=WACC) is 15%.

How to Read This Problem: Whether a question calls the required rate "Cost of Capital," "WACC," or "Required Rate of Return," and whether it labels the answer "Residual Income" or "EVA," recognise this is the SAME underlying calculation taught in two different subjects (SCM and SPMBV) with different vocabulary.

Solution Approach: Compute the capital charge first (Capital Employed × Rate) as a standalone number, then subtract it from profit. This single calculation answers BOTH the "RI" version of the question (as tested in SCM) and the "EVA" version (as tested in SPMBV).

STEP-BY-STEP SOLUTION

Step 1 — Capital Charge: $3,00,00,000 \times 15\% = ₹45,00,000$

Step 2 — Residual Income / EVA: $60,00,000 - 45,00,000 = ₹15,00,000$ (positive)

Interpretation: The division earned ₹15,00,000 MORE than its cost of capital demanded — under SCM's framework, this means the division should be encouraged to keep investing in any project clearing the 15% hurdle (unlike a pure ROI view, which might discourage it); under SPMBV's framework, this same positive figure is evidence of genuine shareholder value creation supporting a valuation premium.

Toolkit 4 — Risk & Return Statistics, and Beta as a Regression Slope

Expected Value & Standard Deviation

$$E(X) = \sum P_i X_i \quad | \quad \sigma = \sqrt{[\sum P_i (X_i - E(X))^2]}$$

SFM SPMBV

SFM uses this for security/portfolio risk (Module 5) and probability-weighted NPV (Module 2); SPMBV's Six Sigma DPMO and SQC control limits (Module 2) rest on the same underlying statistical logic of dispersion around a mean.

Beta (as a Regression Coefficient)

$$\beta = \text{Cov}(R_i, R_m) / \text{Var}(R_m) \quad - \quad \text{identical in structure to regression's: } b = [\sum XY - \sum X \sum Y] / [\sum X^2 - (\sum X)^2]$$

SFM SCM

This is the single most under-appreciated connection in the whole syllabus: CAPM's Beta (SFM Module 5) IS a regression slope coefficient of security returns (Y) against market returns (X) — exactly the "b" you compute in SCM's Module 10 regression forecasting, just with a different X and Y.

Toolkit Illustration 4 — Computing Beta Using the Regression Slope Formula

Over 5 periods, a stock's returns (Y%) and the market's returns (X%) were: (X=8,Y=10), (X=12,Y=15), (X=6,Y=8), (X=10,Y=13), (X=14,Y=18).

How to Read This Problem: Whenever you're given PAIRED return data for a stock and the market across several periods and asked to find Beta, recognise this can be solved with EITHER the Covariance/Variance formula (the "SFM way") OR the regression slope formula (the "SCM way") — they give the identical answer, because Beta literally IS a regression slope.

Solution Approach: Build the summation table ($\sum X$, $\sum Y$, $\sum XY$, $\sum X^2$) exactly as you would for an SCM regression question, then apply the regression "b" formula directly — the result IS your Beta.

STEP-BY-STEP SOLUTION

Step 1 — Build the summation table (n=5): $\sum X=50$, $\sum Y=64$, $\sum XY: (8 \times 10) + (12 \times 15) + (6 \times 8) + (10 \times 13) + (14 \times 18) = 80 + 180 + 48 + 130 + 252 = 690$;
 $\sum X^2: 64 + 144 + 36 + 100 + 196 = 540$

Step 2 — Apply the regression slope (=Beta) formula: $\beta = [5(690) - (50)(64)] / [5(540) - (50)^2] = [3,450 - 3,200] / [2,700 - 2,500] = 250/200 = 1.25$

Interpretation: This stock's Beta is 1.25 — a 25% more volatile-than-market stock. Notice that you solved a "CAPM Beta" problem using nothing but the SCM regression formula you already know — proof that mastering one formula family pays off across subject boundaries.

Toolkit 5 — The Universal Variance Decomposition Pattern (Price/Rate × Usage/Efficiency)

The Universal Two-Way Variance Split

Total Variance = (Rate/Price Variance) + (Usage/Efficiency/Volume Variance)

Rate/Price Variance = Actual Quantity × (Standard Rate - Actual Rate)

Usage/Efficiency Variance = Standard Rate × (Standard Quantity - Actual Quantity)

SCM

This EXACT two-way split pattern (one variance held at Actual quantity, the other held at Standard rate) repeats for Material, Labour, Variable Overhead, AND Sales variances in SCM Module 5 — learn the PATTERN once, not five separate formula sets.

Toolkit Illustration 5 — Applying the SAME Variance Pattern to Two Different Contexts

Context A (Material): Standard = 200 kg at ₹15/kg; Actual = 210 kg at ₹14/kg. Context B (Sales): Standard/Budgeted Sales = 500 units at ₹100/unit; Actual Sales = 480 units at ₹105/unit.

How to Read This Problem: Two seemingly different scenarios — a material cost variance and a sales variance — are secretly the SAME calculation pattern: something (quantity/units) held constant times something else (rate/price) held constant, split two ways. Recognising this pattern means you never need to memorise Material, Labour, and Sales variance formulas as separate things.

Solution Approach: For BOTH contexts, apply the identical template: Rate/Price Variance = Actual Quantity $\times$ (Standard Rate – Actual Rate); Usage/Volume Variance = Standard Rate $\times$ (Standard Quantity – Actual Quantity). Only the labels change.

STEP-BY-STEP SOLUTION

Context A — Material Price Variance: $AQ(SP-AP) = 210 \times (15-14) = \text{₹}210 \text{ Favourable}$

Context A — Material Usage Variance: $SP(SQ-AQ) = 15 \times (200-210) = 15 \times (-10) = \text{₹}150 \text{ Adverse}$

Context B — Sales Price Variance: $\text{Actual Qty}(\text{Std Price}-\text{Actual Price}) = 480 \times (100-105) = 480 \times (-5) = \text{₹}2,400 \text{ Favourable}$ (using the convention that a higher actual price than standard is favourable for sales)

Context B — Sales Volume Variance: $\text{Std Price}(\text{Std Qty}-\text{Actual Qty}) = 100 \times (500-480) = 100 \times 20 = \text{₹}2,000 \text{ Adverse}$

Interpretation: In BOTH contexts, the identical two-way split logic separated a "how much did the rate/price differ" effect from a "how much did the quantity/volume differ" effect — Context A shows cheaper-but-more material used; Context B shows higher-priced-but-fewer units sold. Once you see this shared skeleton, every variance topic in SCM Module 5 becomes a single technique applied five times, not five techniques to memorise separately.

PART I · PAPER 14

Strategic Financial Management (SFM)

Investment decisions, security analysis & portfolio management, financial risk management (derivatives), international finance, and digital finance — 9 modules, 135 MCQs.

5 Sections

9 Modules

135 MCQs

SECTION A

Investment Decisions

Weightage: 25% of total marks | Modules 1–3

Investment Decisions & Capital Budgeting

Covers appraisal techniques for long-term investment proposals: Payback, ARR, NPV, IRR, PI, capital rationing and replacement decisions.

1. Formulas

A. Traditional (Non-Discounting) Methods

Payback Period (even cash flows)

$$\text{Payback Period} = \text{Initial Investment} / \text{Annual Cash Inflow (CFAT)}$$

For uneven cash flows, find the year in which cumulative CFAT equals/exceeds initial investment (use cumulative-CF table).

Payback Reciprocal

$$\text{Payback Reciprocal} = 1 / \text{Payback Period}$$

A rough approximation of IRR when project life is at least twice the payback period and cash inflows are fairly even.

Accounting / Average Rate of Return (ARR)

$$\text{ARR} = \text{Average Annual Profit after Tax} / \text{Average Investment} \times 100$$

Average Investment = (Initial Investment + Salvage Value) / 2 (add working capital if any).

B. Discounting (Time-Adjusted) Methods

Net Present Value (NPV)

$$\text{NPV} = \sum [\text{CF}_t / (1+k)^t] - \text{Initial Investment}$$

Accept if NPV ≥ 0. k = cost of capital / discount rate. Add PV of terminal cash flow (salvage + working capital recovery) in the final year.

Discounted Payback Period

$$\text{DPP} = \text{Year up to which cumulative PV of CFAT} \geq \text{Initial Investment}$$

Uses discounted cash flows instead of nominal cash flows — always ≥ simple payback period.

Profitability Index (PI) / Desirability Factor

$$\text{PI} = \text{PV of Cash Inflows} / \text{Initial Investment}$$

Accept if PI ≥ 1. Used to rank projects under capital rationing (rank by PI, not NPV, when funds are limited).

Internal Rate of Return (IRR) — interpolation

$$\text{IRR} = \text{LR} + [\text{NPV}(\text{LR}) / (\text{NPV}(\text{LR}) - \text{NPV}(\text{HR}))] \times (\text{HR} - \text{LR})$$

LR = lower discount rate (NPV positive), HR = higher rate (NPV negative). Accept if IRR ≥ cost of capital.

Modified IRR (MIRR)

$$\text{MIRR} = [\text{Terminal Value of inflows} / \text{PV of outflows}]^{(1/n)} - 1$$

Overcomes IRR's unrealistic reinvestment-at-IRR assumption by reinvesting inflows at the cost of capital.

Equivalent Annual Cost / Annuity (EAC / EAA)

$$\text{EAC} = \text{NPV (or Total Cost)} / \text{PVIFA (k, n)}$$

Used to compare mutually exclusive projects / assets with unequal lives — choose the option with higher EAA (or lower EAC).

2. Practical Application — When & How to Use

Independent projects (no fund constraint): Accept every project with $NPV \geq 0$ or $IRR \geq \text{cost of capital}$ — no ranking needed.

Mutually exclusive projects: Rank by NPV (theoretically superior — measures absolute rupee wealth added, assumes reinvestment at cost of capital). If NPV and IRR conflict, prefer NPV.

Capital rationing (limited funds): Rank projects by Profitability Index and select combination maximising total NPV within the budget — check for indivisible projects/combinations.

Unequal project lives: Never compare raw NPVs — use Equivalent Annual Annuity (EAA) or the replacement chain method.

3. Worked Illustrations

Illustration 1.1 — NPV, PI and IRR of a Project

A project requires an initial outlay of ₹20,00,000 and is expected to generate CFAT of ₹6,00,000 p.a. for 5 years. Cost of capital = 12%. $PVIFA(12\%,5) = 3.605$; $PVIFA(15\%,5) = 3.352$; $PVIFA(18\%,5) = 3.127$.

How to Read This Problem: This is a classic capital budgeting appraisal question — you're given an outlay, uniform annual cash inflows, a cost of capital, and PVIFA values at multiple rates. The question is really asking three things at once: is this project worth accepting (NPV/PI) and what return does it actually earn (IRR)?

Solution Approach: Work NPV first at the given cost of capital — it directly answers the accept/reject question. Then compute PI as a quick cross-check. For IRR, you need a second NPV at a higher trial rate so you can interpolate between the two — always pick a trial rate that flips the NPV sign (positive to negative) so interpolation stays valid.

STEP-BY-STEP SOLUTION

Step 1 — NPV at 12%: PV of inflows = $6,00,000 \times 3.605 = ₹21,63,000$. $NPV = 21,63,000 - 20,00,000 = ₹1,63,000$

Step 2 — Profitability Index: $PI = 21,63,000 / 20,00,000 = 1.0815$ ($PI > 1 \rightarrow \text{accept}$)

Step 3 — NPV at 18% (trial higher rate): PV of inflows = $6,00,000 \times 3.127 = 18,76,200$. $NPV = 18,76,200 - 20,00,000 = -₹1,23,800$

Step 4 — Interpolate for IRR: $IRR = 12\% + [1,63,000 / (1,63,000 + 1,23,800)] \times (18\% - 12\%) = 12\% + 0.5684 \times 6\% = 12\% + 3.41\% = \approx 15.41\%$

Interpretation: Decision: $NPV > 0$, $PI > 1$, $IRR (15.41\%) > \text{Cost of Capital} (12\%) \rightarrow \text{Accept the project.}$

Illustration 1.2 — Capital Rationing using Profitability Index

Available funds = ₹30,00,000. Four independent, divisible projects:

How to Read This Problem: You're given a fixed pool of funds and several independent, divisible projects with their own outlay and inflow figures — the phrase 'divisible' is the signal that Profitability Index ranking (not simple NPV ranking) is the correct technique here.

Solution Approach: Compute PI for every project first, rank them highest to lowest, then allocate the budget in that rank order. If the budget runs out partway through a project, allocate only the fraction of THAT project the remaining funds can buy — don't skip to the next one.

STEP-BY-STEP SOLUTION

Project	Outlay (₹)	PV of Inflows (₹)	PI
P1	10,00,000	12,50,000	1.25
P2	15,00,000	18,30,000	1.22
P3	8,00,000	9,20,000	1.15

P4	12,00,000	13,32,000	1.11
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Step 1 — Rank by PI: P1 (1.25) > P2 (1.22) > P3 (1.15) > P4 (1.11)

Step 2 — Allocate ₹30,00,000 in rank order: P1 (10,00,000) + P2 (15,00,000) = 25,00,000 used; balance ₹5,00,000 left. Since projects are divisible, invest balance in P3 proportionately: $5,00,000 / 8,00,000 = 62.5\%$ of P3.

Step 3 — NPV generated: P1: 2,50,000 + P2: 3,30,000 + 62.5% of P3's NPV ($1,20,000 \times 0.625 = 75,000$) = **₹6,55,000**

Interpretation: Optimal combination: P1 + P2 + 62.5% of P3, giving maximum total NPV of ₹6,55,000 within the ₹30,00,000 budget.

4. Practice MCQs (15 × 2 Marks)

Q1. A project has an initial outlay of ₹10,00,000 and uniform CFAT of ₹2,50,000 for 6 years. Its payback period is:

- A. 2.5 years
- B. 4.0 years
- C. 4.5 years
- D. 6.0 years

Answer: B

Payback = $10,00,000 / 2,50,000 = 4$ years.

Q2. Under capital rationing with divisible projects, the correct ranking basis is:

- A. Absolute NPV
- B. IRR
- C. Profitability Index
- D. Payback Period

Answer: C

PI ranks projects by return per rupee invested, maximising total NPV under a funds constraint.

Q3. If NPV at 10% is ₹80,000 and NPV at 15% is –₹20,000, the IRR (by interpolation) is approximately:

- A. 11%
- B. 12%
- C. 13%
- D. 14%

Answer: D

$IRR = 10\% + [80,000 / (80,000 + 20,000)] \times 5\% = 10\% + (0.8 \times 5\%) = 10\% + 4\% = 14\%$.

Q4. Payback Reciprocal is a close approximation of IRR when:

- A. Project life is less than payback period
- B. Project life is at least twice the payback period and cash flows are even
- C. Cash flows are highly uneven
- D. Discount rate is zero

Answer: B

This is the stated condition under which payback reciprocal approximates IRR reasonably well.

Q5. For mutually exclusive projects with conflicting NPV and IRR rankings, the theoretically superior criterion is:

- A. IRR, because it is a percentage
- B. Payback Period, because it is simple
- C. NPV, because it measures absolute wealth added assuming reinvestment at cost of capital
- D. ARR, because it uses accounting profit

Answer: C

NPV's reinvestment assumption (at cost of capital) is more realistic than IRR's (reinvestment at IRR itself).

Q6. Two mutually exclusive machines have unequal lives of 4 and 6 years. The correct comparison method is:

- A. Compare raw NPVs directly
- B. Compare Payback Periods only
- C. Equivalent Annual Annuity / Cost method
- D. Compare only initial outlay

Answer: C

EAA/EAC converts unequal-life project NPVs to an annual equivalent basis for fair comparison.

Q7. Discounted Payback Period compared to simple Payback Period is always:

- A. Shorter
- B. Equal
- C. Longer or equal
- D. Unrelated

Answer: C

Discounting reduces the value of future cash flows, so it takes longer (or the same time, only if rate=0%) to recover the investment.

Q8. If PI of a project is exactly 1, then NPV of that project is:

- A. Positive
- B. Negative
- C. Zero
- D. Cannot be determined

Answer: C

PI = PV of inflows/Outlay = 1 means PV of inflows = Outlay, so NPV = 0.

Q9. Average Investment for ARR, when there is a salvage value of ₹50,000 on an asset costing ₹5,50,000, is:

- A. ₹5,50,000
- B. ₹3,00,000
- C. ₹2,75,000
- D. ₹5,00,000

Answer: B

Average Investment = $(5,50,000 + 50,000)/2 = ₹3,00,000$.

Q10. MIRR overcomes a key limitation of ordinary IRR by assuming reinvestment of interim cash flows at:

- A. The IRR itself
- B. The risk-free rate
- C. The firm's cost of capital
- D. Zero rate

Answer: C

MIRR reinvests cash inflows at the more realistic cost of capital rather than at the project's own IRR.

Q11. A project is acceptable under the NPV rule when:

- A. $NPV < 0$
- B. $NPV = 0$ only
- C. $NPV \geq 0$
- D. $IRR < \text{cost of capital}$

Answer: C

$NPV \geq 0$ means the project earns at least the required rate of return; it should be accepted.

Q12. Which of the following ignores the time value of money?

- A. NPV
- B. IRR
- C. Payback Period

D. Profitability Index

Answer: C

Simple payback period does not discount cash flows; discounted payback does.

Q13. In a non-conventional project (cash flow sign changes more than once), a possible problem with IRR is:

- A. Single unique IRR always exists
- B. Multiple IRRs may exist
- C. IRR always equals NPV
- D. No solution issue arises

Answer: B

Descartes' rule of signs implies multiple sign changes can produce more than one IRR solution — MIRR is preferred here.

Q14. Terminal cash flow in capital budgeting typically includes:

- A. Only the initial outlay
- B. Salvage value and recovery of working capital in the final year
- C. Only depreciation
- D. Sunk costs

Answer: B

Terminal cash flow = after-tax salvage value + working capital released, both realised at the end of the project's life.

Q15. Sunk costs already incurred before the investment decision should be:

- A. Included at full value
- B. Excluded from the incremental cash flow analysis
- C. Discounted at a higher rate
- D. Added to the terminal value

Answer: B

Sunk costs are irrelevant to the current decision as they are not affected by accepting or rejecting the project.

Adjustment of Risk & Uncertainty in Investment Decisions

Techniques to incorporate risk into capital budgeting: risk-adjusted discount rate, certainty equivalent, sensitivity, standard deviation of NPV and decision trees.

1. Formulas

Risk-Adjusted Discount Rate (RADR) Method

$$NPV = \sum CFT / (1+k^*)^t - \text{Initial Outlay, where } k^* = R_f + \text{Risk Premium}$$

Higher risk → higher discount rate → lower PV of inflows. Simple but assumes risk increases uniformly over time.

Certainty Equivalent Method

$$\text{Certain Cash Flow} = \text{Risky Cash Flow} \times \text{Certainty Equivalent Coefficient (CEC)}, 0 \leq CEC \leq 1$$

Adjust the numerator (cash flow) for risk and discount the certain cash flows at the risk-free rate.

Expected NPV (probability-weighted)

$$E(NPV) = \sum NPV_i \times P_i$$

Compute NPV under each possible scenario and weight by its probability.

Standard Deviation of Cash Flows / NPV

$$\sigma = \sqrt{\sum P_i (CF_i - E(CF))^2}$$

For a series of independent cash flows across years: $\sigma(NPV) = \sqrt{\sum \sigma_i^2 / (1+r)^{(2t)}}$

Coefficient of Variation (CV)

$$CV = \text{Standard Deviation} / \text{Expected Value}$$

Used to compare relative risk across projects with different scales/expected returns — lower CV = less risky per unit of return.

Sensitivity Analysis

$$\% \text{ Change in NPV} = [(NPV(\text{revised}) - NPV(\text{base})) / NPV(\text{base})] \times 100$$

Test how much a single variable (sales, cost, life) can adversely change before NPV turns negative — identifies the most sensitive variable.

2. Practical Application

RADR vs Certainty Equivalent: RADR is simple but arbitrary in risk premium selection; CEC is theoretically superior as it separates the treatment of risk (in cash flows) from the time value of money (discount rate).

Decision Trees: Use when a decision has sequential stages with different possible outcomes at each stage — evaluate by rolling back from the final branch to compute expected value at each node.

Sensitivity Analysis: Identifies which single assumption the project's viability is most vulnerable to — useful for management focus and contingency planning, but doesn't consider combined variable movement (scenario analysis does).

3. Worked Illustrations

Illustration 2.1 — Certainty Equivalent Method

A project's expected cash flow in Year 1 is ₹5,00,000 with CEC = 0.90, and in Year 2 is ₹6,00,000 with CEC = 0.80. Risk-free rate = 8%.

How to Read This Problem: A risk-adjustment question giving multiple years' cash flows each with its own Certainty Equivalent Coefficient and a risk-free rate — the CEC values are the giveaway that you must adjust the CASH FLOWS for risk, not the discount rate.

Solution Approach: Multiply each year's risky cash flow by its own CEC to get a 'certain' cash flow, then discount each certain cash flow at the RISK-FREE rate (never the risk-adjusted rate — that would double-count risk). Sum the present values at the end.

STEP-BY-STEP SOLUTION

Step 1 — Certain Cash Flows: $Y1 = 5,00,000 \times 0.90 = ₹4,50,000$; $Y2 = 6,00,000 \times 0.80 = ₹4,80,000$

Step 2 — Discount at risk-free rate (8%): $PV(Y1) = 4,50,000 / 1.08 = ₹4,16,667$; $PV(Y2) = 4,80,000 / 1.1664 = ₹4,11,523$

Interpretation: Total PV of certain cash flows = ₹8,28,190 — compare with initial outlay to get NPV under the certainty-equivalent approach.

Illustration 2.2 — Expected NPV with Probabilities

A project's NPV under three economic scenarios: Boom ₹5,00,000 ($P=0.3$), Normal ₹2,00,000 ($P=0.5$), Recession –₹1,00,000 ($P=0.2$).

How to Read This Problem: A scenario/probability question — you're given several possible economic outcomes (Boom/Normal/Recession), each with its own NPV and an assigned probability. This is testing whether you can compute an expected value under uncertainty.

Solution Approach: Multiply each scenario's NPV by its probability, then sum all the weighted values to get Expected NPV. Cross-check that the probabilities given sum to 1 before you start — that's a common error source in these questions.

STEP-BY-STEP SOLUTION

Step 1 — Weight each outcome: Boom: $5,00,000 \times 0.3 = 1,50,000$; Normal: $2,00,000 \times 0.5 = 1,00,000$; Recession: $-1,00,000 \times 0.2 = -20,000$

Step 2 — Sum: $E(NPV) = 1,50,000 + 1,00,000 - 20,000 = ₹2,30,000$

Interpretation: Since $E(NPV) > 0$, the project is acceptable on an expected-value basis (though the 20% recession scenario shows the downside risk).

4. Practice MCQs (15 × 2 Marks)

Q1. In the Certainty Equivalent method, risky cash flows are converted to certain cash flows and then discounted at:

- A. The risk-adjusted rate
- B. The risk-free rate
- C. The IRR
- D. The inflation rate

Answer: B

CEC adjusts the cash flow numerator for risk; discounting is then done at the risk-free rate to avoid double-counting risk.

Q2. Certainty Equivalent Coefficient always lies between:

- A. -1 and 0
- B. 0 and 1
- C. 1 and 2
- D. Any real number

Answer: B

CEC represents the fraction of a risky cash flow considered certain, so $0 \leq \text{CEC} \leq 1$.

Q3. Coefficient of Variation is used primarily to:

- A. Measure absolute risk
- B. Compare relative risk across projects of different sizes
- C. Calculate IRR
- D. Compute payback

Answer: B

$CV = SD/\text{Mean}$ standardises risk per unit of expected return, enabling comparison across differently scaled projects.

Q4. As risk increases, the Risk-Adjusted Discount Rate (RADR) is:

- A. Decreased
- B. Kept constant
- C. Increased
- D. Made negative

Answer: C

Higher perceived risk requires a higher risk premium added to the risk-free rate, raising the discount rate.

Q5. Sensitivity analysis is best described as a technique that:

- A. Changes all variables simultaneously
- B. Changes one variable at a time, holding others constant, to see the impact on NPV
- C. Ignores probability
- D. Is identical to certainty equivalent method

Answer: B

Sensitivity analysis isolates one variable at a time to identify the project's most critical assumption.

Q6. Decision tree analysis is most appropriate when:

- A. There is only one possible outcome
- B. Decisions occur sequentially with multiple future contingencies
- C. There is no uncertainty
- D. The project has no salvage value

Answer: B

Decision trees map sequential decisions and chance events, evaluated by rolling back expected values.

Q7. A key limitation of the Risk-Adjusted Discount Rate method is that it assumes:

- A. Risk decreases over time
- B. Risk increases at a constant/compounding rate over time
- C. Risk is zero
- D. Cash flows are always certain

Answer: B

Since RADR is applied via compounding through $(1+k)^t$, it implicitly assumes risk compounds/increases with time, which may not be realistic.

Q8. If Project X has SD = ₹40,000 and mean NPV = ₹2,00,000, its coefficient of variation is:

- A. 0.10
- B. 0.15
- C. 0.20
- D. 5.00

Answer: C

$CV = 40,000/2,00,000 = 0.20$.

Q9. In probability-weighted expected NPV, the sum of all assigned probabilities of outcomes must equal:

- A. 0
- B. 0.5
- C. 1
- D. 100

Answer: C

Probabilities of mutually exclusive and exhaustive outcomes must sum to 1 (100%).

Q10. Standard deviation of NPV for cash flows that are independent across years is computed using:

- A. Simple addition of yearly SDs
- B. $\sqrt{[\sum \sigma^2 / (1+r)^{2t}]}$
- C. Multiplication of SDs
- D. SD of the first year only

Answer: B

Under independence, variances (not SDs) are additive after discounting each year's variance twice by the discount factor.

Q11. Scenario analysis differs from sensitivity analysis because it:

- A. Changes only one variable at a time
- B. Considers simultaneous, consistent changes in multiple variables under defined scenarios
- C. Ignores probabilities entirely
- D. Cannot be used in capital budgeting

Answer: B

Scenario analysis builds internally consistent combinations of variables (e.g., best case/worst case) rather than isolating one variable.

Q12. Under the certainty equivalent approach, a CEC closer to 1 implies:

- A. High risk in the cash flow
- B. Low risk — cash flow is nearly certain
- C. Negative cash flow
- D. No relationship to risk

Answer: B

A CEC near 1 means the risky cash flow is treated as almost fully certain, indicating low risk.

Q13. Hillier's model for evaluating risk in capital budgeting primarily uses:

- A. Certainty equivalents only
- B. Expected value and standard deviation of NPV based on the statistical distribution of cash flows
- C. Break-even analysis only
- D. Payback period only

Answer: B

Hillier's model computes the expected NPV and its standard deviation, treating cash flows as random variables, to assess a project's risk profile.

Q14. In a decision tree, "rolling back" means:

- A. Computing expected values from the final branches back to the initial decision node
- B. Discarding uncertain branches
- C. Ignoring probabilities
- D. Starting calculation from year 1 forward only

Answer: A

Rolling back evaluates expected value at each chance node starting from the farthest future branch back to the present decision point.

Q15. Which risk-adjustment technique adjusts the discount rate rather than the cash flow?

- A. Certainty Equivalent Method
- B. Risk-Adjusted Discount Rate Method
- C. Decision Tree Method
- D. Sensitivity Analysis

Answer: B

RADR adjusts the denominator (discount rate); CEC instead adjusts the numerator (cash flow).

Leasing Decisions

Lease-vs-buy evaluation from the lessee's perspective — Net Advantage of Leasing, break-even lease rental, and after-tax discounting.

1. Formulas

Net Advantage of Leasing (NAL)

$$\text{NAL} = \text{PV of Cost of Owning (buying)} - \text{PV of Cost of Leasing}$$

If $\text{NAL} > 0$, leasing is preferable; if $\text{NAL} < 0$, buying (owning) is preferable.

Cost of Owning (PV basis)

$$\text{PV of Owning} = \text{Purchase Cost} - \text{PV of Depreciation Tax Shield} - \text{PV of Salvage Value (after tax)} + \text{PV of Maintenance (if any)}$$

Discount at the after-tax cost of debt ($K_d(1-t)$), since leasing/buying is a financing decision, not an operating one.

Cost of Leasing (PV basis)

$$\text{PV of Leasing} = \text{PV of Lease Rentals (net of tax)} + \text{PV of any deposit not refunded} - \text{PV of tax shield on lease rental}$$

Lease rental is fully tax-deductible, generating a tax shield = $\text{Lease Rental} \times \text{Tax Rate}$.

After-tax discount rate

$$K_d(\text{after tax}) = K_d \times (1 - \text{Tax Rate})$$

Since lease vs buy is essentially a debt-substitute financing decision, the after-tax cost of debt is the appropriate discount rate.

Break-even Lease Rental

$$\text{Break-even Lease Rental} = \text{Lease rental at which NAL} = 0$$

Found by equating PV of Cost of Owning to PV of Cost of Leasing and solving for the unknown lease rental.

2. Practical Application

Lessee's viewpoint: Always discount both alternatives at the same after-tax cost of debt — using different rates for owning vs. leasing is a common exam mistake.

Depreciation tax shield: Only relevant to the "owning" alternative since the lessee does not own the asset (and hence cannot claim depreciation) under an operating/finance lease structure for tax purposes.

Lessor's perspective (if asked): Evaluate the lease as an investment — NPV of lease rentals received (after tax) + tax shield on depreciation (lessor owns asset) – cost of the asset.

3. Worked Illustration

Illustration 3.1 — Lease vs Buy (NAL)

Asset cost ₹10,00,000, life 5 years, no salvage value, straight-line depreciation. Tax rate 30%. $K_d = 12\%$, after-tax $K_d = 8.4\%$. Lease rental = ₹2,60,000 p.a. payable in advance for 5 years. $PVIFA(8.4\%, 5) \approx 3.956$ (annuity), and for advance payments treat Year-0 to Year-4.

How to Read This Problem: A lease-vs-buy decision with an asset cost, depreciation basis, tax rate, cost of debt, and a given lease rental — this tests whether you can build TWO separate discounted cash flow streams (owning vs leasing) on a consistent, comparable basis.

Solution Approach: First find the after-tax cost of debt (the correct discount rate for BOTH streams, since this is a financing decision). Build the cost-of-owning stream (asset cost less depreciation tax shield), then the cost-of-leasing stream (after-tax lease rentals). Discount both at the same rate and take the difference (NAL) — never use different discount rates for the two sides.

STEP-BY-STEP SOLUTION

Step 1 — Depreciation tax shield (owning): Depreciation = $10,00,000/5 = 2,00,000$ p.a.; Tax shield = $2,00,000 \times 30\% = 60,000$ p.a. for 5 years. PV of tax shield $\approx 60,000 \times 3.956 = ₹2,37,360$ (annuity in arrears assumption)

Step 2 — PV of cost of owning: Cost of owning = $10,00,000 - 2,37,360 = ₹7,62,640$

Step 3 — After-tax lease rental: Rental after tax shield = $2,60,000 \times (1-0.30) = ₹1,82,000$ p.a., paid in advance (Years 0-4)

Step 4 — PV of cost of leasing: PV (annuity due, 5 yrs at 8.4%) $\approx 1,82,000 \times 3.956 \times 1.084$ (annuity-due adjustment) $\approx ₹7,80,900$

Step 5 — NAL: NAL = PV(Owning) – PV(Leasing) = $7,62,640 - 7,80,900 = -₹18,260$

Interpretation: NAL is negative → Buying (owning) the asset is marginally cheaper than leasing at the given rental; the firm should purchase the asset.

4. Practice MCQs (15 × 2 Marks)

Q1. Lease vs Buy decisions should be evaluated by discounting cash flows at:

- A. Cost of equity
- B. Weighted average cost of capital
- C. After-tax cost of debt
- D. Risk-free rate

Answer: C

Since this is a financing substitute decision, the after-tax cost of debt $K_d(1-t)$ is the appropriate discount rate.

Q2. If Net Advantage of Leasing (NAL) is positive, the firm should:

- A. Buy the asset
- B. Lease the asset
- C. Do neither
- D. Compare with NPV of an unrelated project

Answer: B

Positive NAL means leasing costs less in present value terms than owning, so leasing is preferred.

Q3. Under the "owning" alternative, the depreciation tax shield benefits:

- A. The lessor only
- B. The lessee, since they legally own the asset when buying
- C. Neither party
- D. The bank financing the purchase

Answer: B

When the firm buys the asset outright, it is the legal owner and can claim depreciation as a tax-deductible expense.

Q4. Lease rental payments are typically:

- A. Not tax-deductible
- B. Fully tax-deductible as a business expense
- C. Only 50% deductible
- D. Deductible only if the asset is sold

Answer: B

Lease rentals paid by the lessee are generally allowed as a deductible business expense, generating a tax shield.

Q5. Break-even lease rental is the rental at which:

- A. NAL is maximum
- B. NAL equals zero
- C. Lease rental equals asset cost
- D. Tax rate becomes zero

Answer: B

At break-even lease rental, the lessee is indifferent between leasing and owning since PV of both costs are equal (NAL = 0).

Q6. From the lessor's perspective, the lease is evaluated as:

- A. A cost-saving decision only
- B. An investment decision, similar to a capital budgeting proposal
- C. A dividend decision
- D. A working capital decision

Answer: B

The lessor evaluates the lease like any investment, comparing the asset cost outlay against the PV of after-tax rentals and depreciation tax shields received.

Q7. A key advantage of leasing over buying, often cited qualitatively, is:

- A. Guaranteed higher NPV always
- B. Conservation of working capital / no large upfront outlay
- C. Elimination of all taxes
- D. Ownership transfer at zero cost always

Answer: B

Leasing avoids the large initial cash outflow of purchase, helping the lessee conserve working capital/liquidity.

Q8. If an asset has zero salvage value, the "cost of owning" PV calculation:

- A. Ignores the depreciation tax shield
- B. Excludes the PV of salvage value term (as it's zero)
- C. Cannot be calculated
- D. Equals the lease rental exactly

Answer: B

With zero salvage, that component simply drops out of the cost-of-owning formula; other components remain relevant.

Q9. Lease rentals paid in advance (annuity due) versus in arrears (ordinary annuity) will have:

- A. The same present value always
- B. A higher present value for advance payments (annuity due)
- C. A lower present value for advance payments
- D. No present value at all

Answer: B

Annuity due payments occur earlier, so they have a higher present value than an equivalent ordinary annuity (multiply by $(1+r)$).

Q10. A financial lease is generally characterised by:

- A. Short-term, cancellable agreement
- B. Long-term, non-cancellable agreement transferring substantially all risks/rewards of ownership
- C. No fixed lease term
- D. Immediate transfer of legal title at signing

Answer: B

A finance lease is long-term and non-cancellable, transferring most economic risks and rewards of ownership to the lessee, unlike an operating lease.

Q11. Using different discount rates for the owning and leasing cash flow streams in a lease-vs-buy analysis is:

- A. Recommended practice
- B. A common error — both should use the same after-tax cost of debt
- C. Required by ICMAI

D. Irrelevant to the decision

Answer: B

Both alternatives are financing substitutes for the same asset acquisition, so consistency requires the same discount rate for comparability.

Q12. If maintenance is provided by the lessor and bundled into the lease rental, the lessee's owning-cost calculation should:

- A. Ignore maintenance costs entirely
- B. Add the equivalent maintenance cost the lessee would incur if owning
- C. Subtract maintenance cost from lease rental
- D. Double the tax shield

Answer: B

For a fair comparison, the cost-of-owning stream must also include maintenance the lessee would separately have to pay if they owned the asset.

Q13. NAL is computed from whose perspective, unless stated otherwise?

- A. Lessor
- B. Lessee
- C. Bank
- D. Government

Answer: B

Net Advantage of Leasing is conventionally computed from the lessee's (user's) perspective in lease-vs-buy analysis.

Q14. Tax shield on lease rental equals:

- A. Lease Rental $\times$ Tax Rate
- B. Lease Rental / Tax Rate
- C. Lease Rental $\times$ (1+Tax Rate)
- D. Asset Cost $\times$ Tax Rate

Answer: A

The tax shield from a deductible expense equals the expense multiplied by the applicable tax rate.

Q15. If PV of Cost of Owning = ₹7,50,000 and PV of Cost of Leasing = ₹7,20,000, then NAL and the decision are:

- A. NAL = ₹30,000; Lease the asset
- B. NAL = -₹30,000; Buy the asset
- C. NAL = 0; indifferent
- D. Cannot be determined

Answer: A

$\text{NAL} = 7,50,000 - 7,20,000 = ₹30,000$ (positive) $\rightarrow$ leasing costs less in PV terms, so lease is preferred.

SECTION B

Security Analysis & Portfolio Management

Weightage: 35% of total marks (highest-weighted section) | Modules 4–6

Security Analysis & Valuation (Bonds & Equity)

Bond valuation, yield measures, duration, and equity valuation models (dividend discount, growth models, relative valuation).

1. Formulas

A. Bond / Debenture Valuation

Value of a Bond

$$P = \sum [C / (1+r)^t] + F / (1+r)^n$$

C = annual coupon, F = face/redemption value, r = required yield, n = years to maturity.

Current Yield

$$\text{Current Yield} = \text{Annual Coupon} / \text{Current Market Price}$$

Ignores capital gain/loss at redemption — only measures running income yield.

Yield to Maturity (approximation formula)

$$YTM \approx [C + (F - P)/n] / [(F + P)/2]$$

A quick approximation; exact YTM requires solving the bond-value equation by trial/interpolation (like IRR).

Macaulay Duration

$$\text{Duration} = \sum [t \times PVt] / \text{Price of Bond}$$

Weighted average time to receive the bond's cash flows — measures interest-rate sensitivity.

Modified Duration & Price Change

$$\text{Modified Duration} = \text{Macaulay Duration} / (1+YTM); \% \Delta \text{Price} \approx -\text{Modified Duration} \times \Delta \text{Yield}$$

Used to estimate the approximate % change in bond price for a small change in yield.

B. Equity Valuation

Gordon Growth (Dividend Discount) Model

$$P_0 = D_1 / (K_e - g) = D_0(1+g) / (K_e - g)$$

Valid only when $K_e > g$ (constant, perpetual growth assumption).

Two-Stage Growth Model

$$P_0 = \sum [D_t / (1+K_e)^t] \text{ for high-growth years} + [\text{Terminal Value} / (1+K_e)^n]$$

Terminal Value at end of high-growth phase = $D_{(n+1)} / (K_e - g_{\text{stable}})$, then discounted back to present.

Walter's Model

$$P = [D + (r/K_e)(E-D)] / K_e$$

D=dividend per share, E=EPS, r=internal rate of return, K_e =cost of equity. Relevant when firm's investment decisions link to dividend policy.

P/E based Valuation

$$\text{P/E Ratio} = \text{Market Price} / \text{EPS}; \text{Estimated Price} = \text{EPS} \times \text{Justified/Industry P/E}$$

Relative valuation — quick cross-check against DDM-based intrinsic value.

Sustainable Growth Rate

$$g = \text{Retention Ratio (b)} \times \text{Return on Equity (ROE)}$$

Used to project future dividend growth in DDM when explicit growth isn't given.

2. Practical Application

Bond price vs yield: Bond price and market yield move inversely. If coupon rate > market yield, bond trades at a premium ($P > F$); if coupon < yield, bond trades at a discount ($P < F$).

Choosing a valuation model: Use Gordon Growth only for mature, stable-dividend firms. Use Two-Stage/Multi-stage for high-growth firms expected to stabilise later. Use relative valuation (P/E, EV/EBITDA) as a sanity check.

Duration for portfolio immunisation: Match the duration of assets and liabilities so a bond portfolio's value is protected against interest rate changes (immunisation strategy).

3. Worked Illustrations

Illustration 4.1 — Bond Valuation & YTM

A ₹1,000 face value bond carries a 10% annual coupon, 5 years to maturity, and is currently priced at ₹950.

How to Read This Problem: A bond valuation question giving face value, coupon rate, years to maturity and current market price — since you're asked for YTM (not just price), this is testing the approximation formula for yield, not just plugging into the standard bond pricing formula.

Solution Approach: Apply the YTM approximation formula directly using coupon, redemption value, and years remaining. As a sanity check, compare the bond's price to its face value — if it trades at a discount, your computed YTM MUST exceed the coupon rate, and vice versa for a premium bond.

STEP-BY-STEP SOLUTION

Step 1 — Approx. YTM: $\text{YTM} \approx [100 + (1000 - 950)/5] / [(1000 + 950)/2] = [100 + 10]/975 = 110/975 = 11.28\%$

Step 2 — Verify direction: Since bond is priced below face value (discount bond), $\text{YTM} > \text{coupon rate (10\%)}$ — consistent with our answer.

Interpretation: Approximate YTM $\approx 11.28\%$ p.a. — this exceeds the 10% coupon, confirming the bond is priced at a discount.

Illustration 4.2 — Equity Valuation (Gordon Growth)

A company just paid a dividend (D_0) of ₹8 per share, expected to grow at 6% p.a. forever. Investors require a return (K_e) of 14%.

How to Read This Problem: An equity valuation question giving a recent/expected dividend, a constant growth rate, and a required return — the phrase 'grow at X% forever' is the signal to apply the perpetual Gordon Growth Model rather than a multi-stage model.

Solution Approach: First check whether the dividend given is D_0 (just paid) or D_1 (expected next year) — if it's D_0 , grow it one more year to get D_1 before applying the formula. Then simply plug into $P_0 = D_1 / (K_e - g)$, always confirming $K_e > g$ before you proceed.

STEP-BY-STEP SOLUTION

Step 1 — Next year's dividend: $D_1 = D_0 \times (1+g) = 8 \times 1.06 = ₹8.48$

Step 2 — Apply Gordon Growth formula: $P_0 = D_1 / (K_e - g) = 8.48 / (0.14 - 0.06) = 8.48 / 0.08 = ₹106$

Interpretation: Intrinsic value of the share = ₹106. If market price is below ₹106, the stock may be undervalued (buy signal), and vice versa.

4. Practice MCQs (15 × 2 Marks)

Q1. A bond's price and market interest rates (yield) are related:

- A. Directly (move together)
- B. Inversely
- C. No relationship
- D. Only at maturity

Answer: B

Bond prices and yields move inversely — as required yield rises, present value (price) of fixed future cash flows falls.

Q2. A bond trades at a premium (above face value) when:

- A. Coupon rate < market yield
- B. Coupon rate = market yield
- C. Coupon rate > market yield
- D. Coupon rate is zero

Answer: C

When the coupon offered exceeds the yield investors require, the bond is more attractive and trades above face value.

Q3. Gordon Growth Model is valid only when:

- A. $g > K_e$
- B. $g = K_e$
- C. $K_e > g$
- D. $K_e = 0$

Answer: C

If $g \geq K_e$, the perpetuity formula gives a zero/negative/undefined denominator and the model breaks down.

Q4. Macaulay Duration measures:

- A. Bond's coupon rate
- B. Weighted average time to receive a bond's cash flows
- C. Bond's credit rating
- D. Market capitalisation

Answer: B

Duration is the present-value-weighted average time until all cash flows (coupons + redemption) are received.

Q5. Modified Duration is used to estimate:

- A. Dividend growth rate
- B. Approximate % change in bond price for a change in yield
- C. EPS growth
- D. P/E ratio

Answer: B

$\% \Delta \text{Price} \approx -\text{Modified Duration} \times \Delta \text{Yield}$, giving a first-order estimate of price sensitivity to interest rate changes.

Q6. Current Yield of a bond ignores:

- A. Coupon payments
- B. Capital gain/loss on redemption
- C. Market price
- D. Face value entirely

Answer: B

Current yield = Coupon/Price only captures running income, not the gain or loss from price converging to face value at maturity.

Q7. Walter's Model of dividend policy links share price to:

- A. Only the dividend payout
- B. The relationship between the firm's internal rate of return (r) and cost of equity (Ke)
- C. Only market interest rates
- D. Bond duration

Answer: B

Walter's model shows that dividend policy affects share value depending on whether r is greater than, equal to, or less than Ke.

Q8. If ROE = 15% and retention ratio = 40%, the sustainable growth rate is:

- A. 6%
- B. 15%
- C. 37.5%
- D. 55%

Answer: A

$g = b \times ROE = 0.40 \times 15\% = 6\%$.

Q9. In a Two-Stage Growth Model, the Terminal Value at the end of the high-growth phase is calculated using:

- A. Payback period formula
- B. Gordon Growth formula with the stable growth rate
- C. IRR formula
- D. Current yield formula

Answer: B

Terminal Value = $D(n+1)/(Ke - g \text{ stable})$, applying the constant-growth (Gordon) formula from the point the firm enters stable growth.

Q10. Relative valuation using the P/E multiple estimates share price as:

- A. $EPS / \text{Industry P/E}$
- B. $EPS \times \text{Industry (or justified) P/E}$
- C. $\text{Dividend} / Ke$
- D. $\text{Face Value} \times \text{Coupon}$

Answer: B

Estimated price = $EPS \times \text{the applicable P/E multiple (industry average or justified P/E)}$.

Q11. Portfolio immunisation against interest rate risk is achieved by:

- A. Maximising duration of assets only
- B. Matching the duration of assets with the duration of liabilities
- C. Ignoring duration entirely
- D. Investing only in equity

Answer: B

When asset and liability durations are matched, changes in interest rates affect both sides similarly, protecting net portfolio value.

Q12. A zero-coupon bond's Macaulay Duration equals:

- A. Half its maturity
- B. Its time to maturity
- C. Zero
- D. Twice its maturity

Answer: B

Since a zero-coupon bond has only one cash flow (at maturity), its duration equals its maturity period exactly.

Q13. If required yield equals the coupon rate exactly, a bond will trade:

- A. At a premium
- B. At a discount
- C. At par (face value)
- D. At zero value

Answer: C

When coupon rate = market yield, the bond's PV of cash flows exactly equals its face value — it trades at par.

Q14. Fundamental analysis of a stock primarily examines:

- A. Historical price charts and volume patterns only
- B. Economic, industry, and company-specific factors (EIC framework) to estimate intrinsic value
- C. Only technical indicators like moving averages
- D. Only past dividend payments

Answer: B

Fundamental analysis follows the top-down EIC (Economy-Industry-Company) approach to determine a stock's intrinsic worth.

Q15. Technical analysis, unlike fundamental analysis, primarily relies on:

- A. Company balance sheet analysis
- B. Historical price and volume patterns/charts to predict future price movements
- C. Macroeconomic forecasting
- D. Dividend discount modelling

Answer: B

Technical analysis studies price/volume chart patterns and momentum indicators, assuming history tends to repeat in market behaviour.

Portfolio Theory, Risk-Return & CAPM

Measuring risk and return of securities/portfolios, Markowitz diversification, CAPM/SML, and Arbitrage Pricing Theory basics.

1. Formulas

Expected Return of a Security

$$E(R) = \sum P_i \times R_i$$

Weighted average of possible returns using their probabilities.

Variance & Standard Deviation of a Security

$$\sigma^2 = \sum P_i [R_i - E(R)]^2 ; \sigma = \sqrt{\sigma^2}$$

Measures total risk (dispersion of possible returns around the expected return).

Covariance between two securities

$$\text{Cov}(A, B) = \sum P_i [R_A - E(R_A)][R_B - E(R_B)]$$

Positive covariance = returns move together; negative = they move oppositely (good for diversification).

Correlation Coefficient

$$\rho(A, B) = \text{Cov}(A, B) / (\sigma_A \times \sigma_B)$$

Ranges from -1 to +1. Lower (more negative) correlation between assets gives greater diversification benefit.

Two-Asset Portfolio Return

$$E(R_p) = w_1 E(R_1) + w_2 E(R_2)$$

$w_1 + w_2 = 1$ (weights are proportion of funds invested in each asset).

Two-Asset Portfolio Risk (Variance)

$$\sigma_p^2 = w_1^2 \sigma_1^2 + w_2^2 \sigma_2^2 + 2 w_1 w_2 \sigma_1 \sigma_2 \rho(1, 2)$$

If $\rho = -1$, complete risk elimination is theoretically possible via the right weight combination.

Minimum Variance Portfolio Weight (two assets)

$$w_1^* = (\sigma_2^2 - \text{Cov}(1, 2)) / (\sigma_1^2 + \sigma_2^2 - 2\text{Cov}(1, 2))$$

Gives the weight in Asset 1 that minimises overall portfolio variance; $w_2^* = 1 - w_1^*$.

Beta of a Security

$$\beta = \text{Cov}(R_i, R_m) / \text{Var}(R_m) = [\rho(i, m) \times \sigma_i] / \sigma_m$$

Beta measures systematic (non-diversifiable) risk relative to the market.

Capital Asset Pricing Model (CAPM) / SML

$$E(R_i) = R_f + \beta_i [E(R_m) - R_f]$$

R_f = risk-free rate; $[E(R_m) - R_f]$ = market risk premium. Used as K_e (cost of equity) in many valuation problems.

Portfolio Beta

$$\beta_p = \sum w_i \times \beta_i$$

Weighted average of individual security betas.

2. Practical Application

Diversification benefit: Combining securities with correlation $< +1$ reduces portfolio risk below the weighted average of individual risks — the lower (more negative) the correlation, the greater the risk reduction.

CAPM as Ke: Widely used across SFM to estimate the cost of equity for DDM valuation and WACC computations when a security's beta and market data are given.

Beta interpretation: $\beta=1$ moves with the market; $\beta>1$ is more volatile (aggressive stock); $\beta<1$ is less volatile (defensive stock); $\beta=0$ is uncorrelated with market (theoretically risk-free asset).

3. Worked Illustrations

Illustration 5.1 — Two-Asset Portfolio Risk & Return

Security A: $E(R)=15\%$, $\sigma=20\%$. Security B: $E(R)=10\%$, $\sigma=12\%$. Correlation $\rho(A,B) = 0.4$. Invest 60% in A, 40% in B.

How to Read This Problem: A two-asset portfolio question giving each security's expected return, standard deviation, the correlation between them, and the investment weights — this tests the full portfolio risk-return formula, not just a simple weighted average.

Solution Approach: Compute weighted portfolio RETURN first (a straightforward weighted average). For portfolio RISK, you must use the full variance formula including the cross-term ($2 \cdot w_1 \cdot w_2 \cdot \sigma_1 \cdot \sigma_2 \cdot \rho$) — a very common mistake is forgetting this cross-term and just averaging the two standard deviations.

STEP-BY-STEP SOLUTION

Step 1 — Portfolio Return: $E(R_p) = 0.6(15\%) + 0.4(10\%) = 9\% + 4\% = 13\%$

Step 2 — Portfolio Variance: $\sigma_p^2 = (0.6)^2(20\%)^2 + (0.4)^2(12\%)^2 + 2(0.6)(0.4)(20\%)(12\%)(0.4)$
 $= 144 + 23.04 + 46.08 = 213.12$

Step 3 — Portfolio SD: $\sigma_p = \sqrt{213.12} = \approx 14.60\%$

Interpretation: Portfolio return = 13%, Portfolio risk (SD) = 14.60% — lower than a simple weighted average of individual SDs (17.20%), showing the diversification benefit.

Illustration 5.2 — CAPM (Cost of Equity)

Risk-free rate = 6%, Market return = 14%, Beta of stock = 1.3.

How to Read This Problem: A CAPM question giving the risk-free rate, market return, and a stock's beta — one of the most common quick reversal formulas that also OFTEN sets up a later part of the question (e.g., using this Ke in a DDM valuation).

Solution Approach: Compute the market risk premium first ($R_m - R_f$), then multiply by beta and add to the risk-free rate. Keep the answer clearly labelled as 'Ke' since it's very likely to be needed as an input to another part of a multi-part question.

STEP-BY-STEP SOLUTION

Step 1 — Market Risk Premium: $R_m - R_f = 14\% - 6\% = 8\%$

Step 2 — Apply CAPM: $Ke = R_f + \beta(R_m - R_f) = 6\% + 1.3(8\%) = 6\% + 10.4\% = 16.4\%$

Interpretation: Required return (cost of equity) on the stock = 16.4% — this can now be used as the discount rate (Ke) in a DDM valuation.

4. Practice MCQs (15 × 2 Marks)

Q1. Beta of a security measures:

- A. Total risk
- B. Unsystematic risk
- C. Systematic (market-related) risk
- D. Liquidity risk

Answer: C

Beta captures a security's sensitivity to overall market movements — i.e., non-diversifiable systematic risk.

Q2. If correlation between two securities is exactly -1, a portfolio combination exists where risk can be:

- A. Doubled
- B. Reduced to zero
- C. Kept unchanged
- D. Made negative

Answer: B

Perfect negative correlation allows a specific weight combination that completely eliminates portfolio variance.

Q3. Under CAPM, a stock's required return depends on:

- A. Its total standard deviation only
- B. Its beta and the market risk premium
- C. Its dividend payout ratio only
- D. Its P/E ratio

Answer: B

CAPM: $E(R_i) = R_f + \beta_i(R_m - R_f)$ — only systematic risk (beta) is priced, not total risk.

Q4. A stock with beta = 0 theoretically has a required return under CAPM equal to:

- A. Market return
- B. Risk-free rate
- C. Zero
- D. Infinite

Answer: B

If $\beta=0$, $E(R_i) = R_f + 0 = R_f$ — the required return equals the risk-free rate.

Q5. Diversification primarily helps reduce:

- A. Systematic risk
- B. Unsystematic (firm-specific) risk
- C. Interest rate risk on bonds only
- D. Inflation risk only

Answer: B

Diversification averages out firm-specific (unsystematic) risk across many securities; systematic risk cannot be diversified away.

Q6. Covariance between two securities is positive when:

- A. Their returns move in opposite directions
- B. Their returns tend to move in the same direction
- C. Returns are always equal
- D. One security has zero variance

Answer: B

Positive covariance indicates the two securities' returns tend to rise and fall together.

Q7. The Security Market Line (SML) plots:

- A. Total risk vs return
- B. Beta vs expected return
- C. Price vs earnings
- D. Time vs dividend

Answer: B

SML graphically represents the CAPM relationship between systematic risk (beta, x-axis) and required/expected return (y-axis).

Q8. Portfolio Beta is calculated as:

- A. Simple average of betas
- B. Weighted average of individual security betas
- C. Sum of all betas
- D. Highest individual beta

Answer: B

$\beta_p = \sum w_i \beta_i$, where w_i is the proportion of the portfolio invested in security i .

Q9. If a security's actual expected return lies above the SML, the security is considered:

- A. Overvalued
- B. Undervalued (offering more return than warranted by its risk)
- C. Fairly valued
- D. Risk-free

Answer: B

A point above the SML offers higher return for its beta risk than CAPM predicts, indicating the security is undervalued (attractive buy).

Q10. Correlation coefficient values are bounded between:

- A. 0 and 1
- B. -1 and +1
- C. -100 and +100
- D. 0 and infinity

Answer: B

Correlation coefficient (ρ) always lies between -1 (perfect negative) and $+1$ (perfect positive).

Q11. Arbitrage Pricing Theory (APT), unlike single-factor CAPM, assumes returns are driven by:

- A. A single market factor only
- B. Multiple systematic risk factors (e.g., inflation, interest rates, GDP growth)
- C. No risk factors at all
- D. Only firm-specific factors

Answer: B

APT is a multi-factor model, allowing several macroeconomic risk factors to explain expected returns, unlike CAPM's single market-beta factor.

Q12. The Markowitz efficient frontier represents:

- A. Portfolios with the highest risk for a given return
- B. The set of portfolios offering maximum return for each level of risk (or minimum risk for each level of return)
- C. Only single-security holdings
- D. Risk-free assets only

Answer: B

The efficient frontier is the boundary of optimal risk-return combinations achievable through diversified portfolios.

Q13. Total risk of a security can be decomposed into:

- A. Systematic risk and unsystematic risk
- B. Only market risk
- C. Only default risk
- D. Currency risk only

Answer: A

Total risk (variance) = Systematic (market) risk + Unsystematic (diversifiable, firm-specific) risk.

Q14. Which combination of two securities gives maximum diversification benefit?

- A. Correlation = +1
- B. Correlation = 0
- C. Correlation close to -1
- D. Correlation cannot affect diversification

Answer: C

The more negative the correlation, the greater the offsetting effect between the two securities' returns, maximising risk reduction.

Q15. If two securities have correlation = +1, combining them in a portfolio results in:

- A. Zero portfolio risk always
- B. Portfolio risk equal to the weighted average of individual risks (no diversification benefit)
- C. Portfolio risk higher than either security alone, always
- D. Undefined portfolio risk

Answer: B

With perfect positive correlation, there is no diversification benefit — portfolio SD is simply the weighted average of the individual SDs.

Portfolio & Mutual Fund Performance Evaluation

NAV computation and risk-adjusted performance measures — Sharpe, Treynor, Jensen's Alpha, and Fama's decomposition — used to evaluate fund managers.

1. Formulas

Net Asset Value (NAV) per unit

$$\text{NAV} = (\text{Total Market Value of Assets} - \text{Liabilities}) / \text{Number of Units Outstanding}$$

Mutual fund return over a period = $(\text{NAV}(\text{end}) - \text{NAV}(\text{begin}) + \text{Dividend Distributed}) / \text{NAV}(\text{begin})$

Sharpe Ratio

$$\text{Sharpe Ratio} = (R_p - R_f) / \sigma_p$$

Measures excess return per unit of TOTAL risk (SD) — appropriate when the portfolio is the investor's entire holding (not diversified further).

Treynor Ratio

$$\text{Treynor Ratio} = (R_p - R_f) / \beta_p$$

Measures excess return per unit of SYSTEMATIC risk (beta) — appropriate when the portfolio is one of several held by a diversified investor.

Jensen's Alpha

$$\alpha_p = R_p - [R_f + \beta_p (R_m - R_f)]$$

Positive alpha = fund manager outperformed the CAPM-predicted return (added value); negative alpha = underperformance.

Fama's Net Selectivity (decomposition)

$$\text{Net Selectivity} = (R_p - R_f) - [(\sigma_p / \sigma_m)(R_m - R_f)]$$

Decomposes total excess return into selectivity (stock-picking skill) and diversification components.

Expense Ratio

$$\text{Expense Ratio} = \text{Total Fund Expenses} / \text{Average Net Assets under Management}$$

A lower expense ratio benefits investors by reducing the drag on net returns.

2. Practical Application

Sharpe vs Treynor — choosing the right measure: If evaluating a fund as the investor's sole investment, use Sharpe (total risk matters). If the fund is one part of a larger diversified portfolio, use Treynor (only systematic risk matters, since unsystematic risk is already diversified away elsewhere).

Ranking funds: Funds can rank differently under Sharpe vs Treynor if they have different levels of diversification (different unsystematic risk) — a poorly diversified fund may rank higher on Treynor than on Sharpe.

Jensen's Alpha for manager skill: Since it isolates return not explained by market risk exposure, alpha is the most direct measure of a fund manager's stock-selection skill.

3. Worked Illustration

Illustration 6.1 — Sharpe, Treynor & Jensen's Alpha

Fund P: Return = 18%, SD = 22%, Beta = 1.2. Market Return = 15%, Risk-free rate = 6%.

How to Read This Problem: A mutual fund performance evaluation question giving fund return, standard deviation, beta, market return, and risk-free rate — since ALL THREE risk-adjusted measures are asked (or implied), this tests whether you know which risk measure (total vs systematic) belongs in which ratio's denominator.

Solution Approach: Compute Sharpe using standard deviation, Treynor using beta, then Jensen's Alpha by first computing the CAPM-expected return and subtracting it from the actual return. Keep the three calculations visually separate — mixing up which risk measure goes with which ratio is the single most common error here.

STEP-BY-STEP SOLUTION

Step 1 — Sharpe Ratio: $(18-6)/22 = 12/22 = 0.545$

Step 2 — Treynor Ratio: $(18-6)/1.2 = 12/1.2 = 10.0\%$

Step 3 — CAPM-expected return: $R_f + \beta(R_m - R_f) = 6 + 1.2(15-6) = 6 + 10.8 = 16.8\%$

Step 4 — Jensen's Alpha: $\alpha = 18\% - 16.8\% = +1.2\%$

Interpretation: Positive alpha (+1.2%) indicates Fund P's manager generated returns above what CAPM predicted for its risk level — evidence of stock-picking skill.

4. Practice MCQs (15 × 2 Marks)

Q1. Sharpe Ratio uses which measure of risk in its denominator?

- A. Beta
- B. Standard deviation (total risk)
- C. Correlation
- D. Duration

Answer: B

Sharpe = $(R_p - R_f) / \sigma_p$ uses total risk (standard deviation) as the denominator.

Q2. Treynor Ratio is most appropriate when evaluating a fund that is:

- A. The investor's only holding
- B. One of several holdings in a well-diversified portfolio
- C. Held for less than a day
- D. Entirely in cash

Answer: B

Since Treynor uses beta (systematic risk only), it suits investors who have already diversified away unsystematic risk elsewhere.

Q3. A positive Jensen's Alpha indicates:

- A. Underperformance relative to CAPM expectation
- B. Exact match with CAPM expectation
- C. Outperformance relative to CAPM-predicted return
- D. Zero risk

Answer: C

Positive alpha means actual return exceeded the CAPM-based expected return for that level of systematic risk.

Q4. NAV per unit is computed as:

- A. Total Assets / Total Liabilities

- B. $(\text{Total Assets} - \text{Liabilities}) / \text{Number of Units Outstanding}$
- C. $\text{Total Liabilities} / \text{Number of Units}$
- D. $\text{Market Price} / \text{EPS}$

Answer: B

NAV = Net assets of the fund (assets minus liabilities) divided by units outstanding.

Q5. Two funds may rank differently on Sharpe vs. Treynor primarily because of differences in their:

- A. Fund size
- B. Degree of diversification (unsystematic risk)
- C. Currency of denomination
- D. Fund manager's age

Answer: B

Sharpe penalises total risk (including unsystematic risk), while Treynor only considers beta — a poorly diversified fund can rank differently under each.

Q6. Fama's decomposition splits a portfolio's excess return into components including:

- A. Selectivity and diversification
- B. Payback and ARR
- C. Duration and convexity
- D. Coupon and yield

Answer: A

Fama's model breaks total excess return into a selectivity component (stock-picking) and a diversification component.

Q7. A lower expense ratio, all else equal, results in:

- A. Lower net returns to investors
- B. Higher net returns to investors
- C. No effect on returns
- D. Higher NAV volatility only

Answer: B

Lower expenses mean less drag on fund performance, translating into higher net returns for investors.

Q8. If Fund X has Beta = 0.8 and Fund Y has Beta = 1.5, and both have the same expected return, Treynor Ratio will be:

- A. Higher for Fund X
- B. Higher for Fund Y
- C. Equal for both
- D. Undefined

Answer: A

With the same numerator ($R_p - R_f$) but a smaller beta in the denominator, Fund X's Treynor Ratio will be higher.

Q9. Mutual fund holding period return, given NAV(begin), NAV(end) and dividend distributed, is calculated as:

- A. $\text{NAV}(\text{end}) - \text{NAV}(\text{begin})$ only
- B. $[\text{NAV}(\text{end}) - \text{NAV}(\text{begin}) + \text{Dividend}] / \text{NAV}(\text{begin})$
- C. $\text{Dividend} / \text{NAV}(\text{end})$
- D. $\text{NAV}(\text{begin}) / \text{NAV}(\text{end})$

Answer: B

Total return includes both capital appreciation (NAV change) and income distributed (dividend), divided by beginning NAV.

Q10. Which performance measure is most suitable for measuring pure stock-selection skill of a fund manager?

- A. Sharpe Ratio
- B. Treynor Ratio
- C. Jensen's Alpha
- D. Current Yield

Answer: C

Jensen's Alpha isolates the return unexplained by systematic risk exposure, directly reflecting manager skill.

Q11. If a fund's Sharpe Ratio is negative, it implies:

- A. The fund outperformed the risk-free rate
- B. The fund's return was below the risk-free rate
- C. The fund has zero risk
- D. Beta of the fund is negative

Answer: B

A negative Sharpe Ratio means $R_p < R_f$ — the fund underperformed even a risk-free investment.

Q12. Load charges in mutual funds refer to:

- A. Fund's leverage ratio
- B. Sales charges/fees paid by investors on entry or exit from a fund
- C. A fund's beta
- D. NAV growth rate

Answer: B

Entry/exit loads are commission-type charges deducted from an investor's investment or redemption proceeds.

Q13. A well-diversified fund's Sharpe and Treynor rankings will typically be:

- A. Completely unrelated
- B. Fairly consistent with each other
- C. Always opposite
- D. Impossible to compute

Answer: B

For a well-diversified fund, unsystematic risk is minimal, so total risk $\approx$ systematic risk, making Sharpe and Treynor rankings broadly consistent.

Q14. If CAPM-expected return of a fund is 14% and its actual return is 11%, Jensen's Alpha is:

- A. +3%
- B. -3%
- C. 0%
- D. 25%

Answer: B

Alpha = Actual – CAPM Expected = 11% – 14% = –3% (underperformance).

Q15. An open-ended mutual fund scheme is characterised by:

- A. A fixed number of units traded only on stock exchanges
- B. Continuous sale and repurchase of units by the fund at NAV-based prices
- C. No NAV calculation at all
- D. A fixed maturity date only

Answer: B

Open-ended funds allow investors to buy/sell units directly with the fund house at NAV-based prices at any time, unlike closed-ended funds with fixed unit capital and exchange-traded units.

SECTION C

Financial Risk Management

Weightage: 20% of total marks | Module 7

Financial Derivatives — Forwards, Futures, Options & Swaps

Pricing and hedging using forward/futures contracts, options (intrinsic/time value, put-call parity), and interest rate/currency swaps.

1. Formulas

A. Forwards & Futures

Forward/Futures Price (Cost-of-Carry Model)

$$F_0 = S_0 (1 + r)^t \text{ [or } F_0 = S_0 \times e^{(rt)} \text{ for continuous compounding]}$$

S_0 = spot price, r = risk-free rate, t = time to expiry. For dividend-paying stocks: $F_0 = S_0(1+r)^t - \text{FV of dividends}$.

Basis

$$\text{Basis} = \text{Spot Price} - \text{Futures Price}$$

Basis narrows to zero as the futures contract approaches expiry (convergence).

Number of Futures Contracts for Hedging a Portfolio

$$\text{No. of Contracts} = (\text{Portfolio Value} \times \beta_p) / (\text{Futures Price} \times \text{Contract Multiplier})$$

Used to hedge equity portfolio risk using index futures — matches beta exposure.

B. Options

Intrinsic Value of a Call Option

$$IV(\text{call}) = \text{Max} (0, \text{Spot Price} - \text{Strike Price})$$

A call is "in the money" when spot > strike.

Intrinsic Value of a Put Option

$$IV(\text{put}) = \text{Max} (0, \text{Strike Price} - \text{Spot Price})$$

A put is "in the money" when strike > spot.

Time Value of an Option

$$\text{Time Value} = \text{Option Premium} - \text{Intrinsic Value}$$

Time value decays to zero at expiry (theta decay) — always ≥ 0 before expiry.

Put-Call Parity

$$C + \text{PV}(\text{Strike Price}) = P + \text{Spot Price}$$

C = call premium, P = put premium, both with same strike & expiry. Used to derive one option's fair price from the other.

Payoff of a Call Buyer (at expiry)

$$\text{Payoff} = \text{Max}(0, S_T - K) - \text{Premium Paid}$$

S_T = spot price at expiry, K = strike price. Maximum loss for buyer = premium paid; profit potential is theoretically unlimited.

Hedge Ratio (Delta) for one-period Binomial Model

$$\Delta = (C_u - C_d) / (S_u - S_d)$$

C_u/C_d = option payoff in up/down states; S_u/S_d = stock price in up/down states — the number of shares needed to replicate one option.

C. Swaps

Interest Rate Swap — Net Settlement

$$\text{Net Cash Flow} = (\text{Fixed Rate} - \text{Floating Rate}) \times \text{Notional Principal}$$

Only the net difference is exchanged between counterparties; the notional principal itself is never exchanged.

Comparative Advantage Gain in a Swap

$$\text{Total Gain} = \text{Difference in fixed-rate spreads} - \text{Difference in floating-rate spreads (between the two parties)}$$

The total gain is split between both counterparties (and often the intermediary bank) based on the agreement.

2. Practical Application

Hedging with futures: A company expecting to buy a commodity/currency in future hedges by taking a long futures position (locks in purchase price); one expecting to sell hedges with a short position.

Options vs Futures for hedging: Options provide asymmetric protection (limited downside, unlimited upside for a fixed premium cost) — futures/forwards lock in a price both ways with no premium but no upside flexibility.

Put-Call Parity use: If a call is overpriced relative to parity, an arbitrageur can sell the call, buy the put, buy the stock, and borrow the PV of strike to lock in a riskless profit.

3. Worked Illustrations

Illustration 7.1 — Futures Price (Cost of Carry)

Spot price of a stock index = ₹18,000. Risk-free rate = 8% p.a. Time to expiry = 3 months (0.25 years). No dividends.

How to Read This Problem: A futures pricing question giving spot price, risk-free rate, and time to expiry with no dividends — a direct application of the cost-of-carry model, most commonly tested with a fractional time period (e.g., 3 months = 0.25 years) that catches out students who forget to convert the exponent.

Solution Approach: Apply $F_0 = S_0(1+r)^t$ directly, being careful that 't' is expressed in YEARS (a fraction, if the period is in months) to match the annual rate 'r'. If dividends were given, you would subtract their future value from S_0 first — note their explicit absence here.

STEP-BY-STEP SOLUTION

Step 1 — Apply cost-of-carry formula: $F_0 = S_0(1+r)^t = 18,000 \times (1.08)^{0.25}$

Step 2 — Compute $(1.08)^{0.25}$: ≈ 1.0194

Step 3 — Futures Price: $F_0 = 18,000 \times 1.0194 = \text{₹}18,349$ (approx.)

Interpretation: Fair futures price $\approx \text{₹}18,349$. If the actual quoted futures price differs significantly, a cash-and-carry (or reverse) arbitrage opportunity exists.

Illustration 7.2 — Option Intrinsic Value, Time Value & Put-Call Parity

Stock spot price = ₹500. Call option (Strike ₹480) premium = ₹35. Risk-free rate = 8%, time to expiry = 3 months.

How to Read This Problem: An options question combining THREE distinct definitions (intrinsic value, time value, and put-call parity) in one problem — recognise that this is really three short sequential calculations, not one complicated one.

Solution Approach: Find intrinsic value first (a simple Max/comparison formula), subtract from the given premium to get time value, then separately apply put-call parity (which needs the present value of the strike price, discounted at the risk-free rate over the exact time period given) to find the corresponding option's fair price.

STEP-BY-STEP SOLUTION

Step 1 — Intrinsic Value of Call: $\text{Max}(0, 500 - 480) = ₹20$

Step 2 — Time Value: $35 - 20 = ₹15$

Step 3 — Put price via Put-Call Parity: $P = C + \text{PV}(K) - S = 35 + [480 / (1.08)^{0.25}] - 500$
 $\text{PV}(K) = 480 / 1.0194 = 470.85$. So $P = 35 + 470.85 - 500 = ₹5.85$

Interpretation: Call's intrinsic value = ₹20, time value = ₹15. The corresponding put (same strike & expiry) should be fairly priced at ≈ ₹5.85 under put-call parity.

4. Practice MCQs (15 × 2 Marks)

Q1. A call option is "in the money" when:

- A. Spot price < Strike price
- B. Spot price > Strike price
- C. Spot price = 0
- D. Strike price = 0

Answer: B

A call gives the right to buy at the strike; it is profitable (in the money) when spot exceeds the strike.

Q2. Maximum possible loss for a call option BUYER is:

- A. Unlimited
- B. The premium paid
- C. The strike price
- D. Zero always

Answer: B

The most a call buyer can lose is the premium paid, since they simply won't exercise if unprofitable.

Q3. Time value of an option at expiry is:

- A. Equal to the premium
- B. Zero
- C. Always positive
- D. Negative

Answer: B

As expiry approaches, time value decays to zero — at expiry, the option's premium equals only its intrinsic value.

Q4. Under put-call parity, if $C = ₹40$, $\text{PV}(K) = ₹460$, $S = ₹480$, then P equals:

- A. ₹20
- B. ₹40
- C. ₹460
- D. ₹480

Answer: A

$P = C + \text{PV}(K) - S = 40 + 460 - 480 = ₹20$.

Q5. The cost-of-carry model prices futures higher than spot when:

- A. Risk-free rate is zero
- B. Risk-free rate is positive and no dividends are paid
- C. Dividend yield exceeds the risk-free rate

D. Spot price is zero

Answer: B

With a positive cost of carry (interest cost, no offsetting dividend), fair futures price exceeds spot price (contango).

Q6. "Basis" in futures markets is defined as:

- A. Futures Price – Spot Price
- B. Spot Price – Futures Price
- C. Strike Price – Spot Price
- D. Premium – Intrinsic Value

Answer: B

Basis = Spot – Futures. It converges to zero as the contract nears expiry.

Q7. An investor wanting to hedge an equity portfolio against a market fall would typically:

- A. Buy index futures
- B. Sell (short) index futures
- C. Buy more shares
- D. Do nothing

Answer: B

Shorting index futures offsets losses in the portfolio if the market (and hence portfolio value) falls.

Q8. In an interest rate swap, which of the following is exchanged periodically between counterparties?

- A. The full notional principal
- B. Only the net interest difference (fixed vs floating) on the notional principal
- C. Shares of stock
- D. Foreign currency principal

Answer: B

In a plain vanilla interest rate swap, only the net cash flow difference is exchanged; notional principal is never exchanged.

Q9. A put option's intrinsic value when spot = ₹90 and strike = ₹100 is:

- A. ₹0
- B. ₹10
- C. ₹90
- D. ₹100

Answer: B

$IV(\text{put}) = \text{Max}(0, K - S) = \text{Max}(0, 100 - 90) = ₹10.$

Q10. The number of futures contracts needed to hedge a portfolio increases with:

- A. Lower portfolio beta
- B. Higher portfolio beta
- C. Higher futures price only
- D. Lower portfolio value

Answer: B

No. of contracts = $(\text{Portfolio Value} \times \beta) / (\text{Futures Price} \times \text{Multiplier})$ — directly proportional to beta.

Q11. In the one-period binomial option pricing model, the hedge ratio (delta) represents:

- A. The option's strike price
- B. The number of shares needed to replicate one option's payoff
- C. The risk-free rate
- D. The dividend yield

Answer: B

$\Delta = (C_u - C_d) / (S_u - S_d)$ gives the replicating portfolio's share quantity for the option.

Q12. A forward contract, compared to a futures contract, is:

- A. Exchange-traded and standardised
- B. Over-the-counter (OTC) and customisable between two parties
- C. Always cash-settled daily (mark-to-market)
- D. Never subject to counterparty (default) risk

Answer: B

Forwards are private, customised OTC contracts, unlike standardised, exchange-traded, daily mark-to-market futures.

Q13. If a call option's premium is ₹25 and its intrinsic value is ₹18, its time value is:

- A. ₹7
- B. ₹18
- C. ₹25
- D. ₹43

Answer: A

Time Value = Premium – Intrinsic Value = 25 – 18 = ₹7.

Q14. A currency swap primarily differs from an interest rate swap because it involves:

- A. Exchange of principal and interest in two different currencies
- B. No exchange of principal at all
- C. Only equity instruments
- D. Only government bonds

Answer: A

Currency swaps typically involve exchange of both principal and interest payments in two different currencies, unlike interest rate swaps (same currency, notional not exchanged).

Q15. Arbitrage opportunity in put-call parity arises when:

- A. $C + PV(K) = P + S$ exactly
- B. $C + PV(K) \neq P + S$
- C. The option has zero time to expiry
- D. Options are never mispriced

Answer: B

When the parity equation doesn't hold, a riskless arbitrage profit can be locked in by an appropriate combination of buying/selling the option, stock, and risk-free bond.

SECTION D

International Financial Management

Weightage: 15% of total marks | Module 8

International Financial Management & Forex

Exchange rate quotations, parity relationships (IRP, PPP), covered interest arbitrage, cross rates, and foreign exchange exposure management.

1. Formulas

Forward Premium / Discount (annualised %)

$$\text{Premium/Discount} = [(\text{Forward Rate} - \text{Spot Rate}) / \text{Spot Rate}] \times (12/n) \times 100$$

n = forward contract period in months. Positive = premium (foreign currency strengthening); negative = discount.

Interest Rate Parity (IRP)

$$\text{Forward Rate} / \text{Spot Rate} = (1 + \text{interest rate home}) / (1 + \text{interest rate foreign})$$

Ensures no arbitrage between money markets and forex markets — the currency with the higher interest rate trades at a forward discount.

Purchasing Power Parity (PPP)

$$\text{Expected Spot Rate} = \text{Current Spot Rate} \times (1 + \text{Inflation Home}) / (1 + \text{Inflation Foreign})$$

The currency of the country with higher inflation is expected to depreciate relative to the other.

International Fisher Effect (IFE)

$$(1 + \text{Nominal Rate Home}) / (1 + \text{Nominal Rate Foreign}) = \text{Expected Spot} / \text{Current Spot}$$

Links interest rate differentials to expected changes in exchange rates (assumes real interest rates are equal across countries).

Cross Rate

$$\text{Cross Rate (A/C)} = (\text{A/B}) \times (\text{B/C})$$

Used to derive an exchange rate between two currencies via a common third currency (usually USD).

Covered Interest Arbitrage — Gain/Loss

Compare: [Invest at home rate] vs. [Convert to foreign currency spot → invest at foreign rate → convert back at forward rate]

If the forward-covered foreign investment yields more (or costs less) than the home investment, an arbitrage profit exists.

2. Practical Application

Hedging transaction exposure: An importer with a future foreign-currency payable hedges by buying the currency forward (or via a money-market hedge: borrow home currency, convert now, invest abroad).

IRP vs PPP: IRP links spot/forward rates to interest rate differentials (short-term, market-driven); PPP links spot rates to inflation differentials (longer-term, price-level driven).

Exam tip on quotes: Always identify whether the quote is direct (home currency per unit of foreign) or indirect, and whether you are buying or selling — bank buys low, sells high (bid-ask spread).

3. Worked Illustrations

Illustration 8.1 — Forward Premium & IRP Check

Spot rate: ₹83.00/US\$. 3-month forward rate: ₹83.83/US\$. Indian interest rate = 7% p.a., US interest rate = 3% p.a.

How to Read This Problem: A forex question giving spot rate, forward rate, and interest rates in both countries — since both a forward premium calculation AND an IRP check are implied, this tests whether you can verify market consistency, not just compute a single number.

Solution Approach: Calculate the annualised forward premium/discount first using the standard percentage formula. Separately, compute the IRP-implied forward rate from the two interest rates. Compare the two — if they're close, the market is roughly arbitrage-free; if far apart, flag a potential arbitrage opportunity.

STEP-BY-STEP SOLUTION

Step 1 — Forward Premium on USD (annualised): $[(83.83 - 83.00) / 83.00] \times (12/3) \times 100 = (0.01) \approx 1.0\% \times 4 = 4.0\% \text{ p.a. premium}$

Step 2 — IRP-implied forward rate: $F = \text{Spot} \times (1 + 0.07 \times 3/12) / (1 + 0.03 \times 3/12) = 83.00 \times (1.0175 / 1.0075) \approx 83.00 \times 1.00993 \approx \text{₹83.82}$

Interpretation: The actual quoted forward rate (₹83.83) is almost identical to the IRP-implied rate (₹83.82) — interest rate parity approximately holds, so no material arbitrage opportunity exists.

Illustration 8.2 — Purchasing Power Parity

Current spot rate = ₹83/US\$. Expected inflation: India 6%, USA 2%, over the next year.

How to Read This Problem: A Purchasing Power Parity question giving a current spot rate and expected inflation rates for both countries — the key is identifying which country has HIGHER inflation, since that currency is expected to depreciate.

Solution Approach: Apply the PPP formula directly: multiply the current spot rate by the ratio of $(1 + \text{home inflation})$ to $(1 + \text{foreign inflation})$. Before finalising, sanity-check the DIRECTION of your answer — the higher-inflation country's currency should come out weaker (more units needed to buy foreign currency), not stronger.

STEP-BY-STEP SOLUTION

Step 1 — Apply PPP formula: Expected Spot = $83 \times (1.06 / 1.02)$

Step 2 — Compute: $1.06 / 1.02 = 1.0392$; Expected Spot = $83 \times 1.0392 = \text{₹86.25/US\$}$

Interpretation: The Rupee is expected to depreciate from ₹83 to about ₹86.25 per US\$ over the year, since India's inflation (6%) exceeds the US's (2%).

4. Practice MCQs (15 × 2 Marks)

Q1. Interest Rate Parity implies that the currency with the higher interest rate will trade at a forward:

- A. Premium
- B. Discount
- C. Same as spot always
- D. Zero value

Answer: B

Under IRP, the higher-interest currency must trade at a forward discount to prevent arbitrage.

Q2. Purchasing Power Parity links exchange rate changes to differences in:

- A. Interest rates
- B. Inflation rates
- C. Stock market indices
- D. GDP growth only

Answer: B

PPP states that exchange rates adjust to offset differences in inflation rates between two countries.

Q3. A cross rate between INR and GBP, given INR/USD and USD/GBP rates, is computed by:

- A. Adding both rates
- B. Multiplying the two given rates
- C. Subtracting one from the other
- D. Dividing INR/USD by 2

Answer: B

Cross Rate (INR/GBP) = (INR/USD) × (USD/GBP).

Q4. If the annualised forward premium on USD is 4% and spot is ₹80, the approximate 6-month forward rate is:

- A. ₹80.00
- B. ₹81.60
- C. ₹83.20
- D. ₹84.00

Answer: B

6-month premium = $4\% \times 6/12 = 2\%$ of 80 = ₹1.60; Forward = 80 + 1.60 = ₹81.60.

Q5. Covered Interest Arbitrage becomes profitable when:

- A. IRP holds exactly
- B. The actual forward rate deviates from the IRP-implied forward rate
- C. Interest rates are equal in both countries
- D. There is no forward market

Answer: B

A deviation between market forward rate and the theoretical IRP rate creates a riskless arbitrage opportunity.

Q6. An Indian importer with a US\$ payable due in 3 months should hedge by:

- A. Selling US\$ forward
- B. Buying US\$ forward
- C. Doing nothing
- D. Buying INR forward against INR

Answer: B

Buying US\$ forward locks in the rupee cost of the future dollar payment, hedging against rupee depreciation.

Q7. Transaction exposure refers to risk arising from:

- A. Translating foreign subsidiary financial statements
- B. Contractual foreign-currency cash flows (receivables/payables) that are already committed
- C. General long-term competitive position changes
- D. Domestic-only sales

Answer: B

Transaction exposure arises from specific, already-committed contractual cash flows denominated in a foreign currency.

Q8. Translation exposure arises mainly when:

- A. Consolidating foreign subsidiary accounts into the parent's reporting currency
- B. Making a single export sale
- C. Buying domestic raw materials
- D. Paying local employee salaries

Answer: A

Translation (accounting) exposure results from converting foreign subsidiary financial statements into the parent company's currency for consolidation.

Q9. A money-market hedge for a future foreign currency receivable involves:

- A. Borrowing foreign currency now, converting to home currency, and investing/using it, then repaying the foreign loan from the receivable
- B. Doing nothing until the receivable is due
- C. Only using options
- D. Only used for domestic transactions

Answer: A

A money-market hedge borrows in the foreign currency against the future receivable, converts proceeds now, eliminating exchange rate uncertainty.

Q10. International Fisher Effect (IFE) links exchange rate expectations to differences in:

- A. Nominal interest rates between countries
- B. Trade balances only
- C. Government budget deficits only
- D. Stock indices

Answer: A

IFE states that expected changes in exchange rates are driven by nominal interest rate differentials between two countries.

Q11. If home inflation (6%) exceeds foreign inflation (2%), PPP predicts the home currency will:

- A. Appreciate
- B. Depreciate
- C. Remain unchanged
- D. Become fully convertible

Answer: B

Higher relative inflation erodes a currency's purchasing power, so PPP predicts depreciation against the lower-inflation currency.

Q12. Economic exposure refers to:

- A. Only accounting consolidation effects
- B. The long-term impact of exchange rate changes on a firm's competitive position and future cash flows
- C. Only a single confirmed transaction
- D. Interest rate risk on bonds

Answer: B

Economic exposure captures broader, longer-term effects of currency fluctuations on a firm's overall value and competitiveness.

Q13. In a direct quote (home country convention), an increase in the quoted rate (e.g., ₹/US\$ from 83 to 85) means:

- A. The home currency has appreciated
- B. The home currency has depreciated (weakened)
- C. No change in currency value
- D. The foreign currency has been demonetised

Answer: B

Under a direct quote, more units of home currency are needed to buy one unit of foreign currency — the home currency has weakened.

Q14. The bid-ask spread in a forex quote represents:

- A. The bank's profit margin between buying and selling rates
- B. Government tax on forex transactions
- C. Inflation differential
- D. Interest rate differential

Answer: A

Banks buy currency at the (lower) bid rate and sell at the (higher) ask rate, earning the spread as compensation/profit.

Q15. If IRP does not hold and no transaction costs exist, an arbitrageur would earn a profit through:

- A. Simply holding cash in one currency
- B. Covered interest arbitrage — borrowing in one currency, investing in another, and covering with a forward contract
- C. Buying only domestic government bonds
- D. No profit is possible under any condition

Answer: B

When forward rates deviate from the IRP-implied rate, borrowing low-interest currency and investing in high-interest currency (covered by a forward) yields a riskless arbitrage gain.

SECTION E

Digital Finance

Weightage: 5% of total marks | Module 9

Digital Finance, Fintech & Emerging Concepts

A largely conceptual module — Fintech, blockchain, cryptocurrency, DeFi, digital lending, robo-advisory, CBDC and RegTech — with a few basic quantitative applications.

1. Formulas & Key Metrics

Simple Return on a Digital/Crypto Asset

$$\text{Return \%} = [(\text{Selling Price} - \text{Purchase Price}) / \text{Purchase Price}] \times 100$$

Same basic return concept as any asset — crypto/digital-asset questions usually test this plus volatility/risk discussion.

Effective Annual Yield from Compounding (e.g., DeFi staking APY)

$$\text{APY} = (1 + r/n)^n - 1$$

r = nominal annual rate, n = compounding frequency (e.g., daily staking rewards compounded $n=365$ times).

Peer-to-Peer (P2P) Lending — Effective Yield to Lender

$$\text{Effective Yield} = (\text{Interest Received} - \text{Platform Fee} - \text{Expected Default Loss}) / \text{Amount Lent}$$

Digital lending platforms deduct a platform fee; lenders must also factor in expected default rates on unsecured P2P loans.

2. Key Conceptual Areas (Theory-Heavy — Frequently Tested)

Concept	Exam-Relevant Point
Fintech	Technology-driven innovation in financial services — payments, lending, insurance (insurtech), wealth management (robo-advisory).
Blockchain	Distributed, immutable ledger technology; consensus mechanisms (Proof of Work, Proof of Stake) validate transactions without a central authority.
Cryptocurrency	Digital/virtual currency using cryptography; highly volatile, unregulated in many jurisdictions, taxed as Virtual Digital Assets (VDA) in India.
CBDC (Central Bank Digital Currency)	Sovereign digital currency issued by a central bank (e.g., RBI's e₹), distinct from private cryptocurrency — legal tender status.
DeFi (Decentralised Finance)	Financial services (lending, trading, staking) built on blockchain smart contracts without traditional intermediaries.
Robo-Advisory	Algorithm-driven investment advice/portfolio management with minimal human intervention — typically low-cost, rules-based asset allocation.
RegTech	Technology used by financial institutions to manage regulatory compliance and reporting more efficiently.
Digital Lending	Loan origination, underwriting, and disbursement through digital platforms/apps using alternative data-based credit scoring.

3. Worked Illustration

Illustration 9.1 — Effective Yield on a DeFi Staking Product

A DeFi platform offers a nominal annual staking rate of 12%, compounded daily ($n=365$).

How to Read This Problem: A digital finance/DeFi yield question giving a nominal annual rate and a compounding frequency — this is fundamentally a nominal-to-effective rate conversion question dressed in modern fintech language.

Solution Approach: Apply the standard APY (effective annual rate) formula, being careful to divide the nominal rate by the compounding frequency correctly before raising to the power of that same frequency. The 'DeFi' framing doesn't change the underlying compound interest mathematics at all.

STEP-BY-STEP SOLUTION

Step 1 — Apply APY formula: $APY = (1 + 0.12/365)^{365} - 1$

Step 2 — Compute: $(1.000329)^{365} - 1 \approx 1.1275 - 1 = 0.1275$ or **12.75%**

Interpretation: The effective annual yield (APY) is approximately 12.75%, higher than the nominal 12% rate due to daily compounding.

4. Practice MCQs (15 × 2 Marks)

Q1. Blockchain technology is best described as:

- A. A centralised database maintained by one authority
- B. A distributed, immutable ledger validated through consensus across a network
- C. A type of physical currency
- D. A tax filing software

Answer: B

Blockchain is a decentralised, tamper-resistant ledger shared across multiple nodes, validated via consensus mechanisms.

Q2. A Central Bank Digital Currency (CBDC) differs from cryptocurrency mainly because:

- A. CBDC is issued and backed by the central bank as legal tender, while crypto is typically decentralised and not government-backed
- B. CBDC is more volatile than crypto
- C. Crypto is legal tender in all countries
- D. There is no difference

Answer: A

CBDC is sovereign-issued digital money (legal tender), unlike decentralised, typically non-sovereign cryptocurrencies.

Q3. Robo-advisory platforms primarily provide:

- A. Manual, high-touch wealth management only
- B. Algorithm-based, automated investment advice and portfolio management
- C. Physical gold storage
- D. Only tax filing services

Answer: B

Robo-advisors use algorithms to build and manage portfolios based on investor risk profiles, largely without human advisors.

Q4. RegTech primarily helps financial institutions with:

- A. Marketing campaigns
- B. Efficient regulatory compliance and reporting using technology
- C. Physical branch expansion
- D. Currency printing

Answer: B

RegTech leverages technology (e.g., automation, AI) to streamline compliance monitoring and regulatory reporting.

Q5. DeFi (Decentralised Finance) platforms typically operate using:

- A. Traditional bank intermediaries
- B. Smart contracts on blockchain networks, without traditional intermediaries
- C. Only physical cash
- D. Government bonds exclusively

Answer: B

DeFi replaces traditional financial intermediaries with self-executing smart contracts on a blockchain.

Q6. If a nominal annual rate is 10% compounded monthly, the APY is closest to:

- A. 10.00%
- B. 10.47%
- C. 12.00%
- D. 15.00%

Answer: B

$APY = (1 + 0.10/12)^{12} - 1 \approx 10.47\%$.

Q7. Alternative data-based credit scoring in digital lending typically uses:

- A. Only traditional bank statements
- B. Non-traditional data sources like utility payments, mobile usage, and transaction history
- C. Physical collateral registration only
- D. No data at all

Answer: B

Digital lenders often use alternative data (utility bills, digital footprints, transaction patterns) to assess creditworthiness of thin-file borrowers.

Q8. Insurtech refers to the application of technology in:

- A. Insurance product design, underwriting, and claims processing
- B. Only stock trading
- C. Government taxation
- D. Currency printing

Answer: A

Insurtech uses technology to innovate insurance distribution, underwriting, pricing, and claims settlement.

Q9. Proof of Work and Proof of Stake are examples of:

- A. Tax computation methods
- B. Blockchain consensus mechanisms
- C. Portfolio evaluation ratios
- D. Bond valuation models

Answer: B

Both are consensus mechanisms used by blockchain networks to validate and add new transactions/blocks.

Q10. In India, income from transfer of Virtual Digital Assets (crypto) is:

- A. Fully tax-exempt
- B. Subject to specific taxation provisions under the Income-tax Act
- C. Not recognised as an asset class at all
- D. Taxed only outside India

Answer: B

India has introduced specific provisions taxing gains from Virtual Digital Assets, treating them as a distinct taxable asset class.

Q11. A key risk unique to cryptocurrency investments (compared to traditional securities) is:

- A. Complete price stability
- B. High price volatility and evolving/uncertain regulatory status
- C. Guaranteed government backing
- D. Fixed, predictable returns

Answer: B

Cryptocurrencies are known for extreme price volatility and face varying, evolving regulatory treatment across jurisdictions.

Q12. P2P (Peer-to-Peer) lending platforms primarily function by:

- A. Connecting individual lenders directly with individual/business borrowers via a digital platform

- B. Only lending to large corporations
- C. Issuing physical currency notes
- D. Acting as a stock exchange

Answer: A

P2P platforms match individual lenders with borrowers directly, earning a platform fee, bypassing traditional bank intermediation.

Q13. If crypto asset was bought at ₹40,000 and sold at ₹52,000, the simple return is:

- A. 20%
- B. 23%
- C. 30%
- D. 130%

Answer: C

Return = $(52,000 - 40,000) / 40,000 \times 100 = 30\%$.

Q14. Smart contracts on a blockchain are best described as:

- A. Legal documents requiring manual notarisation each time
- B. Self-executing code that automatically enforces contract terms when predefined conditions are met
- C. Physical paper contracts scanned digitally
- D. A type of bank guarantee

Answer: B

Smart contracts automatically execute predefined actions once conditions coded into them are satisfied, without manual intervention.

Q15. A major benefit typically cited for Fintech-driven financial inclusion is:

- A. Restricting banking access to urban areas only
- B. Extending affordable financial services to previously underserved/unbanked populations via digital channels
- C. Eliminating all financial regulation
- D. Increasing paperwork requirements

Answer: B

Fintech (mobile banking, digital wallets, micro-lending apps) helps extend financial services to unbanked/underbanked populations at lower cost.

PART II · PAPER 16

Strategic Cost Management (SCM)

Strategic cost management for decision making, and quantitative techniques (LP, transportation, game theory, PERT/CPM, calculus, regression) — 10 modules, 150 MCQs.

2 Sections

10 Modules

150 MCQs

SECTION A

Strategic Cost Management for Decision Making

Weightage: 60% of total marks | Modules 1–5

Introduction to Strategic Cost Management

Foundational strategic costing concepts — Target Costing, Life Cycle Costing, Kaizen Costing, and Value Chain Analysis — that shift cost management from a scorekeeping to a strategic role.

1. Formulas

Target Cost

$$\text{Target Cost} = \text{Target Selling Price} - \text{Target (Desired) Profit Margin}$$

Cost is derived backwards from a market-driven price, unlike traditional cost-plus pricing which starts from cost.

Cost Gap (Value Engineering Target)

$$\text{Cost Gap} = \text{Estimated (Current/Drifting) Cost} - \text{Target Cost}$$

The cost gap must be closed through value engineering/value analysis before the product is launched, not by raising price after launch.

Life Cycle Cost

$$\text{Life Cycle Cost} = \text{R\&D Cost} + \text{Design Cost} + \text{Manufacturing Cost} + \text{Marketing \& Distribution Cost} + \text{Customer Service Cost} + \text{Cost of Disposal/Decommissioning}$$

Captures the total cost incurred across a product's entire life, not just its manufacturing phase — often 80-90% of life cycle cost is "locked in" at the design stage.

Kaizen Cost Reduction Target

$$\text{Kaizen Target Cost (Period } t) = \text{Previous Period Actual Cost} \times (1 - \text{Kaizen Reduction Rate})$$

Kaizen costing targets small, continuous cost reductions during the manufacturing/maturity phase (unlike target costing, applied pre-production).

Value Chain Profitability

$$\text{Profit Margin at each Value Chain Activity} = \text{Revenue Attributable} - \text{Cost of that Activity}$$

Used to identify which activities in the chain (inbound logistics → operations → outbound logistics → marketing → service) add the most/least value relative to cost.

2. Practical Application

Target Costing: Best suited to competitive, price-sensitive markets (e.g., consumer electronics, automobiles) where the firm is a "price taker" and must engineer cost down to a market-determined price.

Life Cycle Costing: Critical for products with high upfront R&D/design costs and long usage phases (e.g., pharma, defence equipment, aircraft) — ensures pricing recovers total life cycle cost, not just current-period production cost.

Kaizen vs Target Costing: Target costing acts before production begins (design phase); Kaizen costing acts continuously during production (maturity phase) to sustain margins as prices erode over time.

3. Worked Illustration

Illustration 1.1 — Target Costing & Cost Gap

A company plans to launch a product expected to sell at ₹2,500 per unit. The desired profit margin is 18% of selling price. The current estimated cost (based on existing design) is ₹2,150 per unit.

How to Read This Problem: A target costing question giving expected selling price, a desired margin (check whether it's on price or on cost), and current estimated cost — the 'cost gap' being asked for is the whole point of target costing: work backward from price, not forward from cost.

Solution Approach: Compute target profit first (careful: margin 'on selling price' vs margin 'on cost' give different numbers), subtract to get target cost, then compare against the given estimated cost to find the gap that value engineering must close.

STEP-BY-STEP SOLUTION

Step 1 — Target Profit: $18\% \times 2,500 = ₹450$ per unit

Step 2 — Target Cost: $2,500 - 450 = ₹2,050$ per unit

Step 3 — Cost Gap: Estimated Cost – Target Cost = $2,150 - 2,050 = ₹100$ per unit

Interpretation: A cost gap of ₹100 per unit must be closed through value engineering (redesign, alternate materials/processes) before the product is launched, to achieve the desired 18% margin at the market price of ₹2,500.

4. Practice MCQs (15 × 2 Marks)

Q1. Target Costing determines cost by starting from:

- A. The current production cost
- B. The market-driven selling price, working backwards
- C. The competitor's cost structure only
- D. Historical average costs

Answer: B

Target Costing = Selling Price – Desired Margin, reversing the traditional cost-plus pricing logic.

Q2. The "cost gap" in target costing must ideally be closed through:

- A. Raising the selling price after launch
- B. Value engineering/value analysis before production begins
- C. Reducing product quality without redesign
- D. Ignoring it entirely

Answer: B

Value engineering redesigns the product/process to eliminate unnecessary cost while preserving function, closing the gap pre-launch.

Q3. Life Cycle Costing captures costs across which stages?

- A. Only the manufacturing stage
- B. R&D, design, manufacturing, marketing, service, and disposal — the entire product life
- C. Only the marketing stage
- D. Only the disposal stage

Answer: B

Life cycle costing takes a "cradle to grave" view of total cost incurred over the product's complete life.

Q4. Studies suggest that roughly what proportion of a product's life cycle cost gets "locked in" at the design stage?

- A. 5-10%
- B. 20-30%
- C. 80-90%
- D. 100% only at production stage

Answer: C

Design decisions commit most future costs even though actual expenditure occurs later — hence the strategic emphasis on getting design right.

Q5. Kaizen Costing is best described as:

- A. A one-time cost reduction at the design stage
- B. Continuous, incremental cost reduction efforts during the production/maturity phase
- C. A pricing strategy for new product launches only
- D. A method of inventory valuation

Answer: B

Kaizen costing pursues small, ongoing cost reductions throughout the manufacturing phase, unlike the one-time, pre-production focus of target costing.

Q6. If a product's target selling price is ₹1,000 with desired margin 20% of cost (mark-up on cost), the target cost is:

- A. ₹800
- B. ₹833.33
- C. ₹1,200
- D. ₹900

Answer: B

If margin is 20% of cost: Price = Cost + 0.20 Cost = 1.20 Cost. Cost = 1,000/1.20 = ₹833.33.

Q7. Value Chain Analysis primarily helps a firm identify:

- A. Only its financial statements
- B. Activities that add the most/least value relative to their cost, across the full chain from suppliers to customers
- C. Tax liabilities
- D. Employee attendance patterns

Answer: B

Value chain analysis decomposes a firm's operations into discrete activities to assess where competitive advantage and cost efficiency can be gained.

Q8. Strategic Cost Management differs from traditional cost accounting mainly because it:

- A. Focuses only on historical cost recording
- B. Integrates cost information with strategic decision-making and competitive positioning
- C. Ignores customer and market factors
- D. Applies only to manufacturing costs

Answer: B

SCM uses cost data proactively to support strategic decisions (pricing, product mix, investment) rather than merely recording historical costs.

Q9. A firm using Kaizen Costing achieving a 3% cost reduction target on a previous actual cost of ₹500 per unit should aim for a new cost of:

- A. ₹515
- B. ₹485
- C. ₹500
- D. ₹450

Answer: B

Kaizen Target Cost = $500 \times (1 - 0.03) = 500 \times 0.97 = ₹485$.

Q10. Which of the following industries would benefit MOST from Life Cycle Costing?

- A. A fast-moving consumer good with a 3-month shelf life
- B. Aircraft manufacturing with decades-long R&D, usage, and service support
- C. A single-use retail item
- D. Daily perishable groceries

Answer: B

Products with long life spans and significant upfront R&D/design and after-sale service costs benefit most from a total life cycle costing view.

Q11. Value Engineering aims to:

- A. Reduce cost while maintaining or improving the product's function/quality
- B. Increase cost regardless of function

- C. Eliminate the product entirely
- D. Only apply to marketing expenses

Answer: A

Value engineering systematically analyses functions to achieve required performance at the lowest possible cost.

Q12. Traditional cost-plus pricing differs from target costing in that it:

- A. Starts from cost and adds a margin to arrive at price
- B. Starts from price and works backward to determine allowable cost
- C. Ignores cost entirely
- D. Is identical to target costing

Answer: A

Cost-plus pricing = Cost + Margin = Price (forward calculation), the reverse of target costing's backward approach.

Q13. The primary trigger for using Target Costing is usually:

- A. A monopoly market with no competition
- B. A highly competitive market where the firm cannot dictate selling price
- C. A government-regulated fixed-price product
- D. Absence of any cost data

Answer: B

In competitive markets, price is largely set by the market, forcing firms to manage cost to the target rather than pricing based on cost.

Q14. Which cost is typically EXCLUDED from a traditional (non-life-cycle) product costing approach but INCLUDED in life cycle costing?

- A. Direct materials
- B. Post-sale customer service and disposal/decommissioning costs
- C. Direct labour
- D. Manufacturing overheads

Answer: B

Traditional costing often stops at the point of sale/production; life cycle costing extends to after-sale service and end-of-life disposal costs.

Q15. A firm following the strategic cost management philosophy would most likely make a pricing/design decision based on:

- A. Only the current period's absorption cost
- B. Broader strategic factors — competitive position, customer value, and total life cycle economics
- C. The previous year's budget alone
- D. Random estimation

Answer: B

SCM decisions integrate cost data with strategic, competitive, and customer-value considerations rather than relying on a single period's cost figure.

Quality Cost Management

Classifying and measuring the Cost of Quality (COQ) — prevention, appraisal, internal failure and external failure costs — to guide quality investment decisions.

1. Formulas

Total Cost of Quality (COQ)

$$\text{COQ} = \text{Prevention Cost} + \text{Appraisal Cost} + \text{Internal Failure Cost} + \text{External Failure Cost}$$

The four categories (PAIE) form the standard COQ classification (per ASQ/CIMA terminology).

Cost of Conformance

$$\text{Cost of Conformance} = \text{Prevention Cost} + \text{Appraisal Cost}$$

Costs incurred proactively to ensure quality standards are met (getting it right the first time).

Cost of Non-Conformance

$$\text{Cost of Non-Conformance} = \text{Internal Failure Cost} + \text{External Failure Cost}$$

Costs incurred because of defects — internal (scrap, rework before dispatch) or external (warranty claims, returns, lost customer goodwill after dispatch).

COQ as a % of Sales

$$\text{COQ Ratio} = \text{Total Cost of Quality} / \text{Total Sales} \times 100$$

A key benchmarking and trend-analysis metric — well-run TQM organisations typically target this well below 5%.

Cost of Rework

$$\text{Cost of Rework} = \text{Additional Material} + \text{Labour} + \text{Overheads incurred to correct defective units to a saleable condition}$$

Classified as an Internal Failure Cost.

2. Practical Application

Quality investment trade-off: Increasing spend on prevention and appraisal (conformance costs) reduces failure costs (non-conformance) — the classic "cost of quality" curve shows total COQ is minimised at an optimal quality level, not at zero defects or zero prevention spend.

Shifting the cost mix: Mature quality programs (e.g., Six Sigma, TQM) aim to shift spending from costly failure categories toward cheaper prevention activities — "an ounce of prevention is worth a pound of cure."

External failure costs: Often understated in accounting records because they include hard-to-quantify items like loss of customer goodwill and future lost sales — exam answers should flag this qualitative point.

3. Worked Illustration

Illustration 2.1 — Classifying & Computing Cost of Quality

A company reports: Quality training ₹2,00,000; Inspection of incoming materials ₹1,50,000; Scrap & rework ₹3,00,000; Warranty claims ₹4,50,000; Product testing equipment maintenance ₹1,00,000; Customer returns processing ₹80,000. Total sales = ₹2,50,00,000.

How to Read This Problem: A Cost of Quality question giving a list of cost items with descriptions — this tests classification skill above all: your first job is to correctly bucket each item into Prevention, Appraisal, Internal Failure, or External Failure before any arithmetic begins.

Solution Approach: Read every line item's description carefully and ask 'does this happen BEFORE a defect (P/A) or AFTER one (I/A failure), and if after, was the defect caught internally or did it reach the customer?' Classify first, then simply sum each category and compute the COQ ratio against sales.

STEP-BY-STEP SOLUTION

Step 1 — Classify each cost:

Prevention: Quality training = 2,00,000

Appraisal: Incoming material inspection 1,50,000 + Testing equipment maintenance 1,00,000 = 2,50,000

Internal Failure: Scrap & rework = 3,00,000

External Failure: Warranty claims 4,50,000 + Returns processing 80,000 = 5,30,000

Step 2 — Total COQ: 2,00,000 + 2,50,000 + 3,00,000 + 5,30,000 = ₹12,80,000

Step 3 — COQ as % of Sales: 12,80,000 / 2,50,00,000 × 100 = 5.12%

Interpretation: Total Cost of Quality = ₹12,80,000 (5.12% of sales). External failure cost is the single largest component — the company should investigate root causes of warranty claims and consider increasing prevention spend to shift the mix.

4. Practice MCQs (15 × 2 Marks)

Q1. Which of the following is a Prevention Cost?

- A. Warranty claims
- B. Quality training and process design improvement
- C. Scrap
- D. Customer complaint handling

Answer: B

Prevention costs are incurred to stop defects from occurring in the first place — training and process/design improvement are classic examples.

Q2. Warranty claims and product recalls are classified as:

- A. Prevention Cost
- B. Appraisal Cost
- C. Internal Failure Cost
- D. External Failure Cost

Answer: D

These costs arise after the defective product has reached the customer — classic external failure costs.

Q3. Cost of Conformance includes:

- A. Prevention + Appraisal costs
- B. Internal + External Failure costs
- C. Only Prevention cost
- D. Only External Failure cost

Answer: A

Conformance costs are proactive costs (prevention and appraisal) incurred to achieve quality standards.

Q4. Scrap and rework of defective units identified before dispatch are classified as:

- A. Prevention Cost
- B. Appraisal Cost
- C. Internal Failure Cost
- D. External Failure Cost

Answer: C

Since the defect is caught internally (before reaching the customer), it is an internal failure cost.

Q5. Inspection and testing of finished goods before dispatch is an example of:

- A. Prevention Cost
- B. Appraisal Cost
- C. Internal Failure Cost
- D. External Failure Cost

Answer: B

Appraisal costs relate to measuring/inspecting products to detect defects, such as final inspection before dispatch.

Q6. According to the classic Cost of Quality curve, total COQ is minimised when:

- A. Prevention and appraisal spending is zero
- B. Quality level is at an optimal balance between conformance and non-conformance costs
- C. Defect rate is exactly 100%
- D. Failure costs are maximised

Answer: B

Total COQ is minimised at an optimal quality investment level, not at zero prevention spend or zero defects (in the traditional COQ model).

Q7. External failure costs are often understated in financial records mainly because they include:

- A. Easily quantifiable direct material costs
- B. Intangible costs like loss of customer goodwill and future lost sales
- C. Only depreciation
- D. Only fixed overheads

Answer: B

Reputational damage and lost future sales from dissatisfied customers are real costs but are difficult to measure and often omitted from formal accounts.

Q8. If Total COQ = ₹18,00,000 and Sales = ₹3,00,00,000, the COQ ratio is:

- A. 3%
- B. 6%
- C. 9%
- D. 16.67%

Answer: B

COQ Ratio = $18,00,000 / 3,00,00,000 \times 100 = 6\%$.

Q9. A mature TQM/Six Sigma program typically aims to shift cost mix towards:

- A. Higher external failure cost
- B. Higher prevention cost and lower failure costs overall
- C. Zero quality spending
- D. Higher internal failure cost only

Answer: B

Investing more in prevention reduces the much costlier failure categories, lowering total COQ over time.

Q10. Calibration and maintenance of testing/measuring equipment is classified as:

- A. Prevention Cost
- B. Appraisal Cost
- C. Internal Failure Cost
- D. External Failure Cost

Answer: B

Maintaining testing equipment supports the inspection/appraisal function, so it's classified as an appraisal cost.

Q11. Redesigning a manufacturing process to reduce the likelihood of future defects is a:

- A. Prevention Cost
- B. Internal Failure Cost
- C. External Failure Cost

D. Not a quality cost at all

Answer: A

Proactive process redesign to prevent defects before they occur is a classic prevention cost.

Q12. Cost of Non-Conformance is also referred to as the cost of:

- A. Doing it right the first time
- B. Poor quality / doing it wrong
- C. Only marketing
- D. Only taxation

Answer: B

Non-conformance costs (internal + external failure) represent the cost incurred because quality standards were NOT met.

Q13. Loss of customer goodwill due to a defective product reaching the market is classified under:

- A. Prevention Cost
- B. Appraisal Cost
- C. Internal Failure Cost
- D. External Failure Cost

Answer: D

Since the defect reached the customer and damaged goodwill, this is classified as an external failure cost.

Q14. Which pairing correctly matches the cost category with an appropriate example?

- A. Prevention — Cost of scrap
- B. Appraisal — Statistical process control checks during production
- C. Internal Failure — Warranty replacement
- D. External Failure — Employee training

Answer: B

SPC checks during production are inspection/measurement activities — appraisal cost. (Scrap is internal failure; warranty replacement is external failure; training is prevention.)

Q15. A key benefit of tracking COQ as a percentage of sales over time is that it allows management to:

- A. Ignore quality issues entirely
- B. Benchmark and trend quality performance and cost-effectiveness of quality initiatives
- C. Calculate income tax liability
- D. Set employee salaries

Answer: B

The COQ ratio, tracked over periods, helps management assess whether quality investments are reducing overall quality-related costs.

Decision Making Techniques

Marginal costing-based short-term decisions: CVP analysis, key factor/limiting factor decisions, make-or-buy, shut-down, and relevant costing for special orders.

1. Formulas

Contribution

$$\text{Contribution} = \text{Sales} - \text{Variable Cost} = \text{Fixed Cost} + \text{Profit}$$

The foundation of every marginal-costing decision — only contribution (not full cost) is relevant for most short-term choices.

P/V Ratio (Contribution/Sales Ratio)

$$\text{P/V Ratio} = \text{Contribution} / \text{Sales} \times 100 = (\text{Change in Profit} / \text{Change in Sales}) \times 100$$

Remains constant for a given product mix and cost structure — very useful for quick "what-if" calculations.

Break-Even Point (Units)

$$\text{BEP (units)} = \text{Fixed Cost} / \text{Contribution per Unit}$$

The output level at which total contribution exactly equals fixed cost (zero profit).

Break-Even Point (Sales Value)

$$\text{BEP (₹)} = \text{Fixed Cost} / \text{P/V Ratio}$$

Useful when a single BEP value is needed for a multi-product firm using a weighted-average P/V ratio.

Margin of Safety (MOS)

$$\text{MOS} = \text{Actual (or Budgeted) Sales} - \text{BEP Sales}; \text{MOS Ratio} = \text{MOS} / \text{Actual Sales} \times 100$$

Also: $\text{MOS} = \text{Profit} / \text{P/V Ratio}$ — measures the cushion available before the firm starts incurring losses.

Key Factor / Limiting Factor Ranking

Rank products by: Contribution per unit of the Limiting/Scarce Factor

When a single resource (machine hours, material, labour) is scarce, maximise total contribution by prioritising the product with the highest contribution per unit of that scarce resource — NOT the highest contribution per unit of output.

Shut-Down Point

$$\text{Shut-Down Point (Sales)} = \text{Avoidable (Specific) Fixed Cost} / \text{P/V Ratio}$$

Below this sales level, it is cheaper to shut down (and only incur unavoidable fixed costs) than to continue operating.

Make-or-Buy Decision

Buy if: Purchase Price < Relevant (Marginal) Cost of Making In-house

Only variable/avoidable costs of making are relevant; ignore unavoidable fixed costs and sunk costs unless the freed capacity has an alternative use (opportunity cost).

Relevant Cost for Special/One-Off Order Pricing

Minimum Acceptable Price = Relevant (Incremental) Cost + Opportunity Cost of resources diverted from normal business

Sunk costs and unavoidable fixed costs already being incurred are irrelevant to the special order decision.

2. Practical Application

Key factor decisions — the classic exam trap: Never rank products by contribution per unit alone when a resource is scarce — always divide by the number of scarce-resource units consumed per unit of product.

Make-or-buy with idle capacity that has alternative use: If the capacity freed by buying-in can be used for another profitable product, add that opportunity cost (contribution foregone) to the "cost of making" side before comparing with the buy price.

Shut-down vs continue: A division showing an accounting loss may still be worth continuing if its contribution exceeds its avoidable fixed costs — shutting down only saves avoidable fixed costs, not unavoidable ones.

3. Worked Illustrations

Illustration 3.1 — Key Factor (Limiting Factor) Ranking

A firm makes two products constrained by machine hours (only 10,000 hours available):

How to Read This Problem: A key/limiting factor question giving two or more products with their contribution per unit AND their consumption of a single scarce resource — the classic exam trap is ranking by contribution per unit alone instead of per unit of the SCARCE resource.

Solution Approach: Divide each product's contribution by the units of scarce resource it consumes, rank the results, and allocate the scarce resource to the highest-ranked product first (up to its demand limit) before moving to the next.

STEP-BY-STEP SOLUTION

Particulars	Product A	Product B
Contribution per unit	₹60	₹80
Machine hours per unit	2	4

Step 1 — Contribution per machine hour: A: $60/2 = ₹30/\text{hr}$; B: $80/4 = ₹20/\text{hr}$

Step 2 — Rank by contribution per scarce resource unit: Product A (₹30/hr) ranks ABOVE Product B (₹20/hr) — despite B having higher contribution per unit!

Step 3 — Optimal Plan: Prioritise all available machine hours to Product A first (up to demand limit), then allocate remaining hours to Product B.

Interpretation: Product A should be produced first despite Product B's higher per-unit contribution, because A generates more contribution per unit of the scarce resource (machine hours) — this maximises total contribution from the limited 10,000 hours.

Illustration 3.2 — Make or Buy Decision (with Opportunity Cost)

A component currently made in-house costs: Variable cost ₹45/unit, allocated fixed overhead ₹15/unit (unavoidable), Total cost ₹60/unit. A supplier offers to sell it at ₹52/unit. If the firm buys out, the freed capacity can be used to earn a contribution of ₹10/unit on another product.

How to Read This Problem: A make-or-buy question that also mentions an alternative use for freed-up capacity — that second detail (opportunity cost) is the signal this is NOT a simple 'compare variable cost to buy price' question.

Solution Approach: Identify the relevant (variable) cost of making first, ignoring unavoidable fixed overhead. Then compute the NET cost of buying by taking the buy price and subtracting the contribution that could be earned from the freed capacity's alternative use. Compare the two net figures to decide.

STEP-BY-STEP SOLUTION

Step 1 — Relevant cost of making: Only variable cost is relevant = ₹45/unit (fixed overhead is unavoidable, ignore it)

Step 2 — Add opportunity cost of buying-in: Relevant cost of making (with opportunity cost consideration) = ₹45 (savings if bought) vs. Buy price ₹52, minus alternative use contribution of ₹10 = Net cost of buying = $52 - 10 = ₹42/\text{unit}$

Step 3 — Compare: Cost of making (relevant) = ₹45; Net cost of buying (after using freed capacity for ₹10 contribution) = ₹42

Interpretation: Since buying (net cost ₹42) is cheaper than making (relevant cost ₹45) once the opportunity to earn ₹10 contribution elsewhere is factored in, the firm should BUY the component and redeploy the freed capacity.

4. Practice MCQs (15 × 2 Marks)

Q1. When a single resource is scarce, products should be prioritised based on:

- A. Contribution per unit of product
- B. Contribution per unit of the scarce resource
- C. Selling price per unit
- D. Total fixed cost allocated

Answer: B

Maximising total contribution under a single binding constraint requires ranking by contribution per unit of the scarce resource, not per unit of output.

Q2. In a Make-or-Buy decision, which cost is normally IRRELEVANT (assuming no alternative use of freed capacity)?

- A. Variable material cost
- B. Variable labour cost
- C. Unavoidable fixed overhead already being incurred
- D. Purchase price quoted by supplier

Answer: C

Unavoidable fixed overheads continue regardless of the decision, so they are not relevant to the make-or-buy comparison.

Q3. Margin of Safety can also be calculated as:

- A. Fixed Cost / P/V Ratio
- B. Profit / P/V Ratio
- C. Sales × P/V Ratio
- D. Fixed Cost × Sales

Answer: B

MOS = Profit/P.V. Ratio is a standard alternative formula, since Profit = MOS × P.V. Ratio.

Q4. A firm should consider shutting down a division (in the short run) when:

- A. It shows any accounting loss
- B. Its contribution is less than its avoidable (specific) fixed costs
- C. Its contribution exceeds avoidable fixed costs
- D. Sales are increasing

Answer: B

If contribution can't even cover the fixed costs that would actually be saved by closing, shutting down reduces the loss; otherwise, continuing is better.

Q5. If Sales = ₹10,00,000, Variable Cost = ₹6,00,000, Fixed Cost = ₹3,00,000, the P/V Ratio is:

- A. 30%
- B. 40%
- C. 60%
- D. 70%

Answer: B

Contribution = 10,00,000 – 6,00,000 = 4,00,000. P/V Ratio = 4,00,000/10,00,000 × 100 = 40%.

Q6. Using the above data (Q5), the Break-Even Sales is:

- A. ₹5,00,000
- B. ₹6,00,000
- C. ₹7,50,000

D. ₹9,00,000

Answer: C

BEP (₹) = Fixed Cost/P.V. Ratio = 3,00,000/0.40 = ₹7,50,000.

Q7. The minimum acceptable price for a special one-off order (with idle capacity and no alternative use) should at least cover:

- A. Full absorption cost including all fixed overheads
- B. Only the relevant (incremental/variable) cost of fulfilling the order
- C. The regular selling price
- D. Historical sunk costs

Answer: B

With idle capacity and no alternative use, only the incremental (relevant) cost needs to be recovered — any price above that adds to contribution.

Q8. Sunk costs in a decision-making context should be:

- A. Fully considered as relevant
- B. Ignored, as they don't change with the decision
- C. Doubled for conservative planning
- D. Treated as opportunity costs

Answer: B

Sunk costs have already been incurred and are unaffected by the current decision, so they are excluded from relevant cost analysis.

Q9. If a firm has Fixed Cost = ₹4,00,000 and Contribution per unit = ₹40, its Break-Even Point in units is:

- A. 8,000 units
- B. 10,000 units
- C. 16,000 units
- D. 4,000 units

Answer: B

BEP (units) = 4,00,000/40 = 10,000 units.

Q10. Opportunity cost is best defined as:

- A. A cost already paid in the past
- B. The benefit forgone from the next-best alternative use of a resource
- C. A fixed cost that never changes
- D. The market price of raw material only

Answer: B

Opportunity cost represents the value of the best alternative given up when a resource is used for a particular purpose.

Q11. When two limiting factors constrain production simultaneously, the correct technique to determine the optimal product mix is:

- A. Simple ranking by contribution per unit
- B. Linear Programming
- C. Break-even analysis alone
- D. Payback period

Answer: B

With multiple binding constraints, simple ranking fails — Linear Programming is needed to find the optimal feasible product mix.

Q12. If MOS Ratio is 25% and Actual Sales are ₹8,00,000, the Break-Even Sales is:

- A. ₹2,00,000
- B. ₹6,00,000
- C. ₹6,50,000
- D. ₹7,00,000

Answer: B

MOS = 25% × 8,00,000 = 2,00,000. BEP Sales = Actual Sales – MOS = 8,00,000 – 2,00,000 = ₹6,00,000.

Q13. In a shut-down decision, "avoidable fixed cost" refers to fixed costs that:

- A. Continue even after shutting down
- B. Would be eliminated if the operation/division is shut down
- C. Are always variable in nature
- D. Relate only to head-office allocations

Answer: B

Avoidable fixed costs are specific to the operation and disappear on closure, unlike unavoidable (common/allocated) fixed costs.

Q14. For CVP (Cost-Volume-Profit) analysis to hold, a key underlying assumption is:

- A. Costs can be reliably split into fixed and variable elements, and selling price per unit is constant
- B. All costs are variable
- C. Fixed costs change with volume
- D. Selling price changes with every unit sold

Answer: A

Standard CVP analysis assumes linear cost behaviour (fixed/variable split) and a constant selling price per unit within the relevant range.

Q15. A relevant cost for decision-making must be:

- A. A future, incremental cash flow that differs between the alternatives being considered
- B. A historical, sunk cost
- C. An arbitrarily allocated overhead
- D. Identical across all alternatives

Answer: A

Relevant costs are future-oriented and must differ between the decision alternatives — costs identical across all options or already incurred (sunk) are irrelevant.

Activity Based Management & Just-in-Time (JIT)

Activity Based Costing/Management (ABC/ABM) for more accurate overhead allocation, value-added vs non-value-added activity analysis, and JIT/backflush costing principles.

1. Formulas

Activity Cost Driver Rate

Cost Driver Rate = Total Cost of the Activity Pool / Total Quantity of the Cost Driver

E.g., Machine Set-up Cost Pool / Total Number of Set-ups = Cost per Set-up.

Product Cost under ABC

Cost of Product = Direct Costs + Σ (Activity Cost Driver Rate $\times$ Driver Units Consumed by the Product)

Overheads are traced via multiple activity cost pools/drivers instead of a single blanket/plant-wide overhead rate.

Value-Added vs Non-Value-Added Cost

Non-Value-Added Cost = Cost of activities that can be eliminated without reducing product's value to the customer (e.g., inspection, storage, movement)

ABM uses this classification to target cost reduction efforts at non-value-added activities first.

JIT — Ideal Inventory Holding Cost Reduction

Inventory Carrying Cost Saved = Reduction in Average Inventory $\times$ Carrying Cost Rate per unit

JIT aims to minimise inventory (ideally near zero buffer) by synchronising production with demand and supplier deliveries.

Backflush Costing — Trigger Point Accounting

Costs are recorded (flushed back) at a small number of trigger points (e.g., purchase and completion), rather than tracking WIP at every stage

Simplifies costing procedures in a JIT environment where inventory levels are minimal, making detailed WIP tracking unnecessary/costly.

2. Practical Application

When ABC matters most: ABC gives materially different (and more accurate) product costs than traditional absorption costing when a firm has high overhead relative to direct costs, and diverse products consuming overhead resources in very different proportions (e.g., some products need frequent small-batch set-ups, others don't).

ABM cost reduction focus: Use ABC data to identify high-cost, non-value-added activities (excess material handling, inspection, rework) and target process redesign or elimination there first.

JIT prerequisites: JIT requires reliable suppliers, short set-up times, a stable production schedule, and strong quality control — since there's little buffer stock to absorb supply or quality disruptions.

3. Worked Illustration

Illustration 4.1 — Activity Based Costing

Total Set-up Cost Pool = ₹6,00,000, with 400 set-ups during the year. Product X requires 5 set-ups to produce its annual batch of 2,000 units; Product Y requires 15 set-ups to produce its annual batch of 3,000 units.

How to Read This Problem: An Activity Based Costing question giving a total cost pool, its cost driver volume, and how much of that driver each product consumes — this tests whether you understand that ABC allocates cost by ACTUAL resource consumption, not by output volume.

Solution Approach: Compute the cost driver rate first (pool cost ÷ total driver volume), then multiply by each product's specific driver consumption to get its allocated cost, and divide by units produced to get a per-unit figure. Compare the per-unit results across products to see the distortion a volume-based rate would have hidden.

STEP-BY-STEP SOLUTION

Step 1 — Cost Driver Rate: $6,00,000 / 400 \text{ set-ups} = ₹1,500 \text{ per set-up}$

Step 2 — Set-up cost allocated to Product X: $5 \times 1,500 = ₹7,500$; per unit = $7,500/2,000 = ₹3.75/\text{unit}$

Step 3 — Set-up cost allocated to Product Y: $15 \times 1,500 = ₹22,500$; per unit = $22,500/3,000 = ₹7.50/\text{unit}$

Interpretation: Product Y bears double the set-up cost per unit (₹7.50 vs ₹3.75) because it requires proportionally more set-ups relative to its batch size — a traditional volume-based overhead rate would have masked this difference and undercosted Y.

4. Practice MCQs (15 × 2 Marks)

Q1. Activity Based Costing (ABC) allocates overheads to products based on:

- A. A single plant-wide volume-based rate
- B. Multiple cost drivers linked to the activities that actually consume resources
- C. Direct labour hours only, regardless of activity
- D. Equal allocation to every product

Answer: B

ABC identifies distinct activities and their cost drivers, tracing overheads more accurately than a single blanket rate.

Q2. ABC is most beneficial when a firm has:

- A. Low overhead and a single homogeneous product
- B. High overhead and diverse products consuming resources in very different proportions
- C. No overheads at all
- D. Identical products with identical batch sizes

Answer: B

ABC's benefit (more accurate costing) is greatest when overheads are significant and product diversity causes distortions under traditional volume-based costing.

Q3. A non-value-added activity is one that:

- A. Directly increases the product's value to the customer
- B. Can be eliminated without reducing the value the customer perceives in the product
- C. Is always a direct material cost
- D. Cannot be identified or measured

Answer: B

Non-value-added activities (e.g., excess handling, storage, inspection) consume resources without adding customer-perceived value — prime targets for elimination.

Q4. JIT (Just-in-Time) production philosophy primarily aims to:

- A. Maximise inventory buffers
- B. Minimise inventory by synchronising production with actual demand and supply
- C. Increase batch sizes indefinitely
- D. Eliminate quality control entirely

Answer: B

JIT seeks to produce/procure only what is needed, when needed, minimising inventory holding costs and waste.

Q5. Backflush Costing is typically used in conjunction with:

- A. Traditional job costing with detailed WIP tracking
- B. JIT environments with minimal inventory, recording costs at a few trigger points
- C. Standard absorption costing only
- D. Process costing with no automation

Answer: B

Backflush costing simplifies accounting in JIT settings by recording costs only at key trigger points, since detailed WIP tracking adds little value when inventory is minimal.

Q6. If Total Inspection Cost Pool = ₹4,00,000 with 1,000 inspection hours, the cost driver rate per inspection hour is:

- A. ₹40
- B. ₹400
- C. ₹4,000
- D. ₹4

Answer: B

Cost Driver Rate = $4,00,000 / 1,000 = ₹400$ per inspection hour.

Q7. Traditional volume-based overhead absorption tends to:

- A. Always cost products more accurately than ABC
- B. Overcost high-volume, simple products and undercost low-volume, complex products
- C. Have no impact on product costing
- D. Only apply to service industries

Answer: B

A single volume-based rate spreads overhead evenly by volume, which tends to shift cost burden unfairly from complex/low-volume products onto simple/high-volume ones.

Q8. For JIT to work effectively, a firm most critically needs:

- A. Large safety stocks of raw material
- B. Reliable suppliers, short set-up times, and strong quality control
- C. Unpredictable, fluctuating production schedules
- D. Long lead times from suppliers

Answer: B

Since JIT carries minimal buffer stock, dependable supply, quick changeovers, and high quality are essential prerequisites.

Q9. Activity Based Management (ABM) uses ABC data primarily to:

- A. Only prepare external financial statements
- B. Manage and improve processes by targeting non-value-added activities for reduction/elimination
- C. Calculate income tax
- D. Set employee salaries

Answer: B

ABM leverages the detailed activity-cost information from ABC to drive process improvement and cost reduction decisions.

Q10. Material handling and storage of work-in-progress inventory awaiting the next process are typically classified as:

- A. Value-added activities
- B. Non-value-added activities
- C. Direct material costs
- D. Prevention costs

Answer: B

Storage and unnecessary handling do not add value from the customer's perspective and are targeted for reduction under ABM/JIT.

Q11. Under ABC, if a product requires a disproportionately high number of machine set-ups relative to its production volume, its allocated set-up cost per unit will be:

- A. Lower than under traditional volume-based costing
- B. Higher than under traditional volume-based costing, revealing the true cost of complexity
- C. Identical under both methods
- D. Zero

Answer: B

ABC correctly assigns more set-up cost to products causing more set-ups, unlike volume-based costing which would understate this complexity cost.

Q12. Just-in-Time purchasing typically involves:

- A. Bulk purchases stored for long periods
- B. Frequent, small deliveries synchronised closely with production needs
- C. No supplier relationships at all
- D. Purchasing only at year-end

Answer: B

JIT purchasing relies on frequent small deliveries timed to actual production needs, minimising raw material inventory.

Q13. A cost pool in ABC refers to:

- A. A single direct material item
- B. A grouping of overhead costs associated with a particular activity
- C. Total sales revenue
- D. Cash held in a bank account

Answer: B

A cost pool aggregates all overhead costs related to a specific activity (e.g., all costs of the "machine set-up" activity) before applying a driver rate.

Q14. A limitation often cited for ABC implementation is:

- A. It is always cheaper to implement than traditional costing
- B. The cost and complexity of identifying activities and cost drivers can be significant
- C. It never improves costing accuracy
- D. It can only be used in service industries

Answer: B

Implementing ABC requires significant effort in identifying activities, cost pools, and appropriate drivers — a real practical cost/complexity trade-off.

Q15. In a JIT environment, inspection at the receiving dock for incoming materials is often reduced or eliminated by:

- A. Increasing safety stock instead
- B. Developing long-term quality partnerships with certified/reliable suppliers
- C. Ignoring quality altogether
- D. Outsourcing all production

Answer: B

JIT firms often build long-term supplier relationships with quality certification, reducing the need for incoming inspection (a non-value-added activity).

Evaluating Performance

Standard costing & variance analysis, transfer pricing between divisions, and divisional/managerial performance measures (ROI, RI, EVA, Balanced Scorecard).

1. Formulas

A. Variance Analysis

Material Cost Variance (MCV)

$$\text{MCV} = (\text{Standard Qty} \times \text{Standard Price}) - (\text{Actual Qty} \times \text{Actual Price})$$

MCV = Material Price Variance + Material Usage Variance.

Material Price & Usage Variance

$$\text{Price Variance} = \text{Actual Qty} \times (\text{Standard Price} - \text{Actual Price})$$

$$\text{Usage Variance} = \text{Standard Price} \times (\text{Standard Qty} - \text{Actual Qty})$$

Standard Qty is the quantity that SHOULD have been used for actual output achieved.

Labour Cost, Rate & Efficiency Variance

$$\text{Labour Cost Variance} = (\text{SH} \times \text{SR}) - (\text{AH} \times \text{AR}); \text{Rate Variance} = \text{AH}(\text{SR} - \text{AR}); \text{Efficiency Variance} = \text{SR}(\text{SH} - \text{AH})$$

SH/AH = Standard/Actual Hours; SR/AR = Standard/Actual Rate.

Fixed Overhead Variances

$$\text{FOH Cost Variance} = \text{Absorbed FOH} - \text{Actual FOH}$$

$$= \text{Expenditure Variance} + \text{Volume Variance}$$

$$\text{Volume Variance} = \text{Efficiency Variance} + \text{Capacity Variance}$$

Expenditure Variance = Budgeted FOH – Actual FOH; Volume Variance = Absorbed FOH – Budgeted FOH.

Sales Variances

$$\text{Sales Value Variance} = \text{Actual Sales} - \text{Budgeted Sales}$$

$$= \text{Sales Price Variance} + \text{Sales Volume Variance}$$

Sales Volume Variance can be further split into Sales Mix Variance + Sales Quantity Variance for multi-product firms.

B. Divisional Performance & Transfer Pricing

Return on Investment (ROI)

$$\text{ROI} = \text{Net Operating Profit} / \text{Capital Employed (Investment)} \times 100$$

A relative (%) measure — can discourage a manager from accepting a project with return above the cost of capital but below the division's current average ROI.

Residual Income (RI)

$$\text{RI} = \text{Net Operating Profit} - (\text{Capital Employed} \times \text{Cost of Capital} / \text{Required Rate of Return})$$

An absolute (₹) measure — encourages goal congruence better than ROI, since managers accept any project earning above the cost of capital.

Economic Value Added (EVA)

$$\text{EVA} = \text{NOPAT} - (\text{Capital Employed} \times \text{WACC})$$

NOPAT = Net Operating Profit After Tax. Similar concept to RI but uses WACC and typically several accounting adjustments (e.g., capitalising R&D).

Transfer Price — General Rule

Minimum Transfer Price = Marginal (Variable) Cost + Opportunity Cost to the Selling Division

If the selling division has spare capacity, opportunity cost = 0, so minimum transfer price = marginal cost.

2. Practical Application

Investigating variances: Not every variance needs investigation — apply "management by exception," investigating only significant variances (in absolute rupee terms or as a % of standard) that are controllable and cost-effective to correct.

ROI vs RI for goal congruence: A division with high current ROI may reject a genuinely good project (return > cost of capital but < current ROI) to avoid dragging down its average — RI/EVA avoid this dysfunctional behaviour since they reward any project clearing the cost-of-capital hurdle.

Transfer pricing with external market: If a perfectly competitive external market exists for the intermediate product, market price is generally the best transfer price, preserving divisional autonomy and correct decision signals.

3. Worked Illustrations

Illustration 5.1 — Material Variances

Standard: 100 kg of material at ₹20/kg for the actual output achieved. Actual: 110 kg purchased and used at ₹18/kg.

How to Read This Problem: A standard costing variance question giving standard quantity/price and actual quantity/price — always identify which figures are 'standard' (the benchmark) and which are 'actual' before plugging into any formula, since mixing them up flips the favourable/adverse sign.

Solution Approach: Compute the total cost variance first as a sanity-check total, then break it into Price Variance (using actual quantity) and Usage/Efficiency Variance (using standard price), and verify the two sub-variances sum back to your total variance.

STEP-BY-STEP SOLUTION

Step 1 — Material Cost Variance: $(100 \times 20) - (110 \times 18) = 2,000 - 1,980 = ₹20 \text{ (Favourable)}$

Step 2 — Material Price Variance: $AQ(SP-AP) = 110 \times (20-18) = 110 \times 2 = ₹220 \text{ (Favourable)}$

Step 3 — Material Usage Variance: $SP(SQ-AQ) = 20 \times (100-110) = 20 \times (-10) = ₹200 \text{ (Adverse)}$

Step 4 — Check: Price Variance (220 F) + Usage Variance (200 A) = 20 (F) = MCV ✓

Interpretation: Overall material cost was ₹20 favourable — but this masks a favourable price effect (₹220 F, cheaper material bought) largely offset by an adverse usage effect (₹200 A, more material consumed than standard) — worth investigating if the cheaper material caused excess wastage.

Illustration 5.2 — ROI vs Residual Income (Goal Congruence Problem)

Division has Capital Employed = ₹50,00,000 and current Net Operating Profit = ₹12,50,000 (Current ROI = 25%). Cost of Capital = 12%. A new project requires additional investment of ₹5,00,000, expected to earn additional profit of ₹90,000 (project ROI = 18%).

How to Read This Problem: A divisional performance question comparing ROI-based and RI-based decisions on the SAME proposed project — the point being tested is the classic goal-congruence conflict between the two measures, not just the arithmetic itself.

Solution Approach: Compute the division's CURRENT ROI, then the ROI IF the new project is accepted, to see whether a self-interested manager would reject it under ROI. Separately compute the project's own Residual Income to show whether it should genuinely be accepted from the company's perspective.

STEP-BY-STEP SOLUTION

Step 1 — Effect on Divisional ROI if accepted: New ROI = $(12,50,000 + 90,000) / (50,00,000 + 5,00,000) = 13,40,000 / 55,00,000 = 24.36\%$ — LOWER than current 25%

Step 2 — Manager's likely decision under ROI evaluation: Manager may REJECT the project since it drags down divisional ROI, even though 18% return exceeds the 12% cost of capital.

Step 3 — Residual Income of the new project alone: RI = $90,000 - (5,00,000 \times 12\%) = 90,000 - 60,000 = \text{₹}30,000$ (positive)

Interpretation: Under RI, the project adds positive residual income (₹30,000) and should be ACCEPTED — RI correctly motivates goal-congruent behaviour, whereas ROI could wrongly cause the manager to reject a value-adding project.

4. Practice MCQs (15 × 2 Marks)

Q1. Material Price Variance is calculated as:

- A. Standard Qty × (Standard Price – Actual Price)
- B. Actual Qty × (Standard Price – Actual Price)
- C. Actual Qty × Actual Price
- D. Standard Qty × Standard Price

Answer: B

Price Variance isolates the price effect using the actual quantity purchased/used: $AQ(SP-AP)$.

Q2. A key advantage of Residual Income (RI) over Return on Investment (ROI) as a performance measure is that RI:

- A. Is always a higher number than ROI
- B. Better promotes goal congruence by encouraging acceptance of any project earning above the cost of capital
- C. Does not require knowledge of capital employed
- D. Is unaffected by the cost of capital

Answer: B

Since RI rewards absolute value added above the cost of capital, managers are motivated to accept all value-adding projects, unlike under ROI.

Q3. The minimum transfer price, when the selling division has NO spare capacity (fully utilised), should be:

- A. Marginal cost only
- B. Marginal cost plus the opportunity cost (contribution foregone from the external market)
- C. Zero
- D. Always equal to full cost regardless of capacity

Answer: B

With no spare capacity, transferring internally means giving up an external sale, so the lost contribution must be added as opportunity cost.

Q4. Fixed Overhead Volume Variance is calculated as:

- A. Budgeted FOH – Actual FOH
- B. Absorbed FOH – Budgeted FOH
- C. Absorbed FOH – Actual FOH
- D. Actual FOH × Standard Rate

Answer: B

Volume Variance = Absorbed FOH – Budgeted FOH, reflecting the effect of actual output differing from budgeted output.

Q5. If Labour Rate Variance is ₹500 (Adverse) and Labour Efficiency Variance is ₹800 (Favourable), the total Labour Cost Variance is:

- A. ₹1,300 Favourable
- B. ₹300 Favourable
- C. ₹300 Adverse
- D. ₹1,300 Adverse

Answer: B

Labour Cost Variance = Rate Variance + Efficiency Variance = $(-500) + 800 = \text{₹}300$ Favourable.

Q6. EVA (Economic Value Added) is computed as:

- A. $\text{NOPAT} + (\text{Capital Employed} \times \text{WACC})$
- B. $\text{NOPAT} - (\text{Capital Employed} \times \text{WACC})$
- C. $\text{NOPAT} / \text{Capital Employed}$
- D. $\text{Capital Employed} - \text{NOPAT}$

Answer: B

EVA = Net Operating Profit After Tax minus a capital charge ($\text{Capital Employed} \times \text{WACC}$).

Q7. "Management by exception" in variance analysis means:

- A. Investigating every single variance regardless of size
- B. Investigating only significant/material variances that are cost-effective to control
- C. Ignoring all variances
- D. Only investigating favourable variances

Answer: B

Management by exception focuses limited investigative resources on the variances that matter most (in size and controllability), not every minor deviation.

Q8. Sales Volume Variance for a multi-product firm can be further split into:

- A. Price Variance and Usage Variance
- B. Sales Mix Variance and Sales Quantity Variance
- C. Rate Variance and Efficiency Variance
- D. Expenditure Variance and Capacity Variance

Answer: B

Sales Volume Variance breaks down into a Mix Variance (change in proportion of products sold) and a Quantity Variance (change in total units sold).

Q9. If a division has ROI higher than its current average, accepting a new project with return above the cost of capital but below the current ROI creates the risk that the manager will:

- A. Always accept the project
- B. Reject the project to protect the division's average ROI, even though it's value-adding
- C. Ignore the cost of capital entirely
- D. Immediately resign

Answer: B

This is the classic dysfunctional behaviour risk of using ROI as a sole performance measure — a value-adding project may be rejected to protect the division's average.

Q10. When a perfectly competitive external market exists for an intermediate product, the most appropriate transfer price is usually:

- A. Full cost plus a large arbitrary mark-up
- B. The prevailing external market price
- C. Zero
- D. An amount fixed permanently regardless of market conditions

Answer: B

Market price preserves correct economic signals and divisional autonomy when a competitive external market for the product exists.

Q11. Fixed Overhead Expenditure Variance is calculated as:

- A. $\text{Budgeted Fixed Overhead} - \text{Actual Fixed Overhead}$
- B. $\text{Absorbed Fixed Overhead} - \text{Budgeted Fixed Overhead}$
- C. $\text{Actual Fixed Overhead} \times \text{Standard Rate}$
- D. $\text{Standard Hours} \times \text{Standard Rate}$

Answer: A

Expenditure Variance isolates the spending effect: $\text{Budgeted FOH} - \text{Actual FOH incurred}$.

Q12. The Balanced Scorecard evaluates organisational performance across which typical perspectives?

- A. Only financial perspective

- B. Financial, Customer, Internal Business Process, and Learning & Growth
- C. Only customer satisfaction surveys
- D. Only employee headcount

Answer: B

The Balanced Scorecard (Kaplan & Norton) evaluates performance holistically across these four linked perspectives, not financial measures alone.

Q13. If Capital Employed = ₹20,00,000, Cost of Capital = 10%, and Net Operating Profit = ₹3,00,000, the Residual Income is:

- A. ₹1,00,000
- B. ₹2,00,000
- C. ₹3,00,000
- D. ₹5,00,000

Answer: A

$RI = 3,00,000 - (20,00,000 \times 10\%) = 3,00,000 - 2,00,000 = ₹1,00,000.$

Q14. Negotiated transfer pricing is most appropriate when:

- A. There is a perfect external market with no bargaining needed
- B. No perfect external market exists and both divisions have some bargaining power over the internal price
- C. Only one division exists in the company
- D. Transfer pricing is banned by law

Answer: B

Negotiation works well when market price isn't clearly determinable and both divisional managers have autonomy to agree on mutually acceptable terms.

Q15. A limitation of ROI as a divisional performance measure is that it:

- A. Always encourages optimal investment decisions
- B. Can motivate managers to reject value-adding projects that would lower their division's current average ROI
- C. Is unaffected by asset valuation methods
- D. Cannot be manipulated by managers

Answer: B

Because ROI is a ratio, managers focused on maintaining a high average may reject genuinely value-adding investments — a well-documented dysfunctional incentive.

SECTION B

Quantitative Techniques in Decision Making

Weightage: 40% of total marks | Modules 6–10

Linear Programming

Formulating and solving resource-allocation problems using an objective function and constraints — graphical method for two variables, and shadow price interpretation.

1. Formulas

General LP Formulation

Maximise (or Minimise) $Z = c_1x_1 + c_2x_2 + \dots + c_nx_n$

Subject to: $a_1x_1 + a_2x_2 + \dots \leq/\geq/= b_i$ (for each constraint i); $x_1, x_2, \dots \geq 0$

Z = objective function (usually profit/contribution to maximise, or cost to minimise); x_i = decision variables (units to produce/allocate).

Graphical Method (2-variable problems)

Plot each constraint as a line → identify the feasible region (satisfying all constraints) → evaluate Z at every corner (vertex) point of the feasible region

The optimal solution always occurs at one of the corner points of the feasible region (Fundamental Theorem of LP).

Shadow Price (Dual Value)

Shadow Price = Change in Optimal Objective Function Value per unit increase in the RHS of a BINDING constraint

Shadow price of a non-binding (slack) constraint is always zero — the constraint isn't limiting the optimal solution.

Slack / Surplus Variable

Slack (for $\leq$ constraint) = RHS - LHS at the optimal solution; Surplus (for $\geq$ constraint) = LHS - RHS

Zero slack/surplus means the constraint is binding (fully utilised) at the optimum.

2. Practical Application

Identifying decision variables: Always define decision variables clearly first (e.g., x_1 = units of Product A, x_2 = units of Product B) before writing the objective function and constraints — most marks are lost from incorrect formulation, not calculation.

Using shadow price for decisions: A positive shadow price on a resource (e.g., machine hours) tells management the maximum premium worth paying to acquire one more unit of that scarce resource.

Sensitivity/range analysis: Shadow prices are valid only within a certain range of the RHS value — beyond that range, the set of binding constraints (and hence the shadow price) may change.

3. Worked Illustration

Illustration 6.1 — Graphical LP Solution

Maximise $Z = 40x_1 + 30x_2$, subject to: $2x_1 + x_2 \leq 40$ (Machine hours); $x_1 + 2x_2 \leq 50$ (Labour hours); $x_1, x_2 \geq 0$.

How to Read This Problem: A Linear Programming question giving an objective function and two or more constraints in $\leq$ form with two decision variables — since it's two variables, the graphical method (not simplex) is the expected solution technique.

Solution Approach: Find where each pair of constraints intersects to identify the feasible region's corner points, then evaluate the objective function Z at EVERY corner point (including the axes-intercept points) — the fundamental theorem of LP guarantees the optimum sits at one of these corners.

STEP-BY-STEP SOLUTION

Step 1 — Find intersection of the two constraints (corner point): Solve $2x_1 + x_2 = 40$ and $x_1 + 2x_2 = 50$ simultaneously.
From eqn 1: $x_2 = 40 - 2x_1$. Substitute into eqn 2: $x_1 + 2(40 - 2x_1) = 50 \Rightarrow x_1 + 80 - 4x_1 = 50 \Rightarrow -3x_1 = -30 \Rightarrow x_1 = 10, x_2 = 20$

Step 2 — Evaluate Z at all corner points:

$(0,0): Z=0$ | $(20,0): Z=800$ | $(0,25): Z=750$ | $(10,20): Z=40(10)+30(20)=400+600=1,000$

Step 3 — Identify optimal point: Maximum $Z = ₹1,000$ occurs at $(x_1=10, x_2=20)$ — both constraints are binding here.

Interpretation: Optimal solution: produce 10 units of Product 1 and 20 units of Product 2, giving maximum contribution of ₹1,000, fully utilising both machine hours and labour hours.

4. Practice MCQs (15 × 2 Marks)

Q1. In Linear Programming, the optimal solution to a maximisation/minimisation problem occurs at:

- A. The centre of the feasible region
- B. One of the corner (vertex) points of the feasible region
- C. Outside the feasible region
- D. A random interior point

Answer: B

The Fundamental Theorem of Linear Programming states the optimum always occurs at a vertex (corner point) of the feasible region.

Q2. The Shadow Price of a resource represents:

- A. The market price of the resource
- B. The change in the optimal objective function value per unit increase in that resource's availability
- C. The total cost of the resource used
- D. A fixed accounting rate

Answer: B

Shadow price measures the marginal value of relaxing a binding constraint by one unit.

Q3. A non-binding constraint at the optimal solution has a shadow price of:

- A. A large positive number
- B. Zero
- C. A negative number always
- D. Equal to the objective function coefficient

Answer: B

If a constraint isn't fully used (has slack) at the optimum, relaxing it further has no effect on the objective function — shadow price = 0.

Q4. For a $\leq$ type constraint, "slack" refers to:

- A. LHS minus RHS
- B. RHS minus LHS (unused capacity of that resource)
- C. Always zero
- D. The objective function value

Answer: B

Slack = RHS – LHS represents the unused portion of a resource constraint at a given solution.

Q5. The graphical method of solving LP problems is limited to:

- A. Any number of decision variables
- B. Problems with only two decision variables
- C. Only minimisation problems
- D. Only integer solutions

Answer: B

The graphical method works only for two-variable problems since it relies on plotting constraints on a 2-dimensional plane.

Q6. In LP formulation, the non-negativity constraint ($x_i \geq 0$) exists because:

- A. Decision variables like units produced cannot logically be negative
- B. It simplifies the objective function only
- C. It has no real-world meaning
- D. It only applies to minimisation problems

Answer: A

Since decision variables typically represent physical quantities (units, hours), negative values would be meaningless.

Q7. If a resource constraint is binding at the optimal solution, its slack value is:

- A. Positive
- B. Zero
- C. Negative
- D. Undefined

Answer: B

A binding constraint is fully utilised (LHS = RHS at optimum), so its slack is exactly zero.

Q8. The feasible region in a Linear Programming problem is defined as:

- A. The area violating at least one constraint
- B. The set of all points satisfying all constraints simultaneously (including non-negativity)
- C. Only the origin point
- D. The objective function line itself

Answer: B

The feasible region contains every combination of decision variable values that satisfies all constraints at once.

Q9. If two different corner points give the SAME (best) value of the objective function, the LP problem has:

- A. No solution
- B. Multiple (alternate) optimal solutions
- C. An infeasible solution
- D. An unbounded solution

Answer: B

When the objective function is parallel to a constraint boundary, every point along that boundary segment yields the same optimal value — multiple optima.

Q10. An LP problem is said to be "unbounded" when:

- A. The feasible region is empty
- B. The objective function can be increased (or decreased) indefinitely within the feasible region
- C. There is exactly one feasible solution
- D. All constraints are equalities

Answer: B

An unbounded LP has a feasible region that is not enclosed in the direction of optimisation, so Z can grow without limit.

Q11. An LP problem with no feasible region satisfying all constraints simultaneously is called:

- A. Unbounded
- B. Infeasible
- C. Degenerate

D. Optimal

Answer: B

Infeasibility occurs when the constraints are mutually contradictory, leaving no point that satisfies all of them.

Q12. Simplex method is generally preferred over the graphical method when:

- A. There are only 2 decision variables
- B. There are more than 2 decision variables
- C. There are no constraints
- D. The objective function is non-linear

Answer: B

The Simplex algorithm can handle LP problems with any number of variables, unlike the 2-variable-only graphical method.

Q13. If a resource has a shadow price of ₹25 per hour, a firm should be willing to pay up to _____ to acquire one additional hour of that resource.

- A. ₹0
- B. ₹25
- C. ₹50
- D. An unlimited amount

Answer: B

The shadow price directly indicates the maximum premium worth paying for one more unit of that binding resource.

Q14. In LP, decision variables typically represent:

- A. Fixed costs
- B. The quantities to be decided (e.g., units of each product to produce)
- C. Historical sales figures
- D. Tax rates

Answer: B

Decision variables are the unknowns the model solves for — typically production/allocation quantities.

Q15. Sensitivity analysis in LP examines:

- A. How the optimal solution changes with variations in objective function coefficients or constraint RHS values
- B. Only the initial feasible solution
- C. Employee productivity only
- D. Tax implications of the solution

Answer: A

Sensitivity analysis studies the range over which coefficients/RHS values can change without altering the optimal basis/solution structure.

Transportation, Assignment & Game Theory

Special-structure LP problems: minimising transportation cost (NW Corner/Least Cost/VAM + MODI), the Assignment problem (Hungarian method), and competitive Game Theory.

1. Formulas

A. Transportation Problem

Initial Basic Feasible Solution (IBFS) Methods

North-West Corner Method (ignores cost); Least Cost Method; Vogel's Approximation Method (VAM – uses penalty = difference between two lowest costs in each row/column)

VAM generally gives the IBFS closest to the optimal solution, minimising the number of iterations needed for optimality testing.

Optimality Test — MODI (Modified Distribution) Method

For each occupied (basic) cell: $u_i + v_j = C_{ij}$. For each unoccupied cell: $\Delta_{ij} = C_{ij} - (u_i + v_j)$

Solution is optimal (for minimisation) when all $\Delta_{ij} \geq 0$. If any $\Delta_{ij} < 0$, that cell can improve the solution — reallocate along its closed loop.

Degeneracy Check

Number of Basic (occupied) Cells required = $m + n - 1$ (m = rows/sources, n = columns/destinations)

If occupied cells $< m+n-1$, the solution is degenerate — add an infinitesimally small allocation (ϵ) to an independent unoccupied cell to proceed with MODI.

B. Assignment Problem

Hungarian Method — Steps

1. Row reduction (subtract row minimum from each row)
2. Column reduction (subtract column minimum from each column)
3. Cover all zeros with minimum number of lines
4. If lines = n (order of matrix), optimal assignment exists; else adjust matrix and repeat

Used for minimising total cost (or maximising total profit, by first converting to an equivalent minimisation problem) of assigning n jobs to n workers/machines, one-to-one.

Maximisation Assignment Problem

Convert to minimisation by: New Matrix Value = (Largest Value in Matrix) – Each Original Value

Then apply the standard Hungarian minimisation method on the converted matrix.

C. Game Theory

Value of Game — Pure Strategy (Saddle Point)

Maximin (Row Player) = Minimax (Column Player) $\Rightarrow$ Saddle point exists, Value of Game = that common value

Maximin = highest of the row-minimums; Minimax = lowest of the column-maximums.

Mixed Strategy — 2×2 Game (No Saddle Point)

For payoff matrix $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$:

Probability for Row Player's Strategy 1: $p = (d - c) / (a + d - b - c)$

Value of Game: $V = (ad - bc) / (a + d - b - c)$

Used when no saddle point exists (Maximin $\neq$ Minimax) — players must randomise their strategies with these optimal probabilities.

Principle of Dominance

A strategy is dominated (and can be eliminated) if another strategy is always at least as good, regardless of the opponent's choice

Used to reduce the size of a payoff matrix before solving, especially for matrices larger than 2×2 .

2. Practical Application

Choosing an IBFS method: VAM is preferred in exams when time permits, since it usually yields a solution needing fewer MODI iterations than NW Corner (fast but crude) or Least Cost.

Unbalanced transportation/assignment problems: If total supply $\neq$ total demand (or jobs $\neq$ workers), add a dummy source/destination (or dummy job/worker) with zero cost to balance the problem before solving.

Game theory in business: Used to model competitive strategic decisions (e.g., pricing wars, advertising spend) between two rival firms where each firm's optimal choice depends on the other's likely response.

3. Worked Illustrations

Illustration 7.1 — Assignment Problem (Hungarian Method)

Cost matrix for assigning 3 jobs to 3 workers (₹):

How to Read This Problem: An Assignment Problem giving a cost matrix — recognise this immediately as a square matrix requiring the Hungarian Method, not general Linear Programming, since each row (worker) must be matched to exactly one column (job).

Solution Approach: Perform row reduction (subtract each row's minimum), then column reduction (subtract each remaining column's minimum), then try to cover all zeros with the minimum number of lines — if that number equals the matrix's order, you can read off a valid one-to-one assignment directly from the zeros.

STEP-BY-STEP SOLUTION

	Job 1	Job 2	Job 3
Worker A	10	12	9
Worker B	8	11	7
Worker C	13	10	12

Step 1 — Row reduction (subtract row min: A-9, B-7, C-10):

A: 1, 3, 0 | B: 1, 4, 0 | C: 3, 0, 2

Step 2 — Column reduction (col minimums are 1,0,0 — subtract from column 1 only):

A: 0, 3, 0 | B: 0, 4, 0 | C: 2, 0, 2

Step 3 — Cover zeros with minimum lines & find optimal assignment: Assign A→Job1 or Job3, B→Job1 or Job3, C→Job2. Testing: A→Job3, B→Job1, C→Job2 gives a valid one-to-one assignment.

Step 4 — Compute total cost from ORIGINAL matrix: A→Job3 (9) + B→Job1 (8) + C→Job2 (10) = ₹27

Interpretation: Optimal assignment: Worker A→Job 3, Worker B→Job 1, Worker C→Job 2, at a minimum total cost of ₹27.

Illustration 7.2 — Game Theory (Mixed Strategy, 2×2)

Payoff matrix (Row Player's gain) — no saddle point exists: $[[a,b],[c,d]] = [[4, 2], [1, 5]]$

How to Read This Problem: A 2×2 Game Theory question giving a payoff matrix — your very first step must always be checking for a saddle point (Maximin = Minimax), since that single check determines whether you need the mixed-strategy formulas at all.

Solution Approach: Compute each row's minimum and take the largest (Maximin); compute each column's maximum and take the smallest (Minimax). If they're equal, that's the game's value with a pure strategy — done. If not, only then apply the mixed-strategy probability and value formulas.

STEP-BY-STEP SOLUTION

Step 1 — Check for saddle point: Row minimums: 2, 1 → Maximin=2. Column maximums: 4, 5 → Minimax=4. Since Maximin (2) ≠ Minimax (4), no saddle point — mixed strategy needed.

Step 2 — Optimal probability for Row Player's Strategy 1 (p): $p = (d-c)/(a+d-b-c) = (5-1)/(4+5-2-1) = 4/6 = 0.667$; Strategy 2 probability = $1-0.667 = 0.333$

Step 3 — Value of the Game: $V = (ad-bc)/(a+d-b-c) = (4 \times 5 - 2 \times 1)/6 = (20-2)/6 = 18/6 = 3.0$

Interpretation: The Row Player should play Strategy 1 with probability 0.667 and Strategy 2 with probability 0.333, yielding an expected game value of 3.0 (this is the payoff the Row Player can guarantee regardless of the opponent's strategy).

4. Practice MCQs (15 × 2 Marks)

Q1. Which method for finding the Initial Basic Feasible Solution in a transportation problem generally produces the solution closest to optimal?

- A. North-West Corner Method
- B. Least Cost Method
- C. Vogel's Approximation Method (VAM)
- D. Random allocation

Answer: C

VAM uses penalty costs to make smarter initial allocations, typically requiring fewer iterations to reach optimality than NW Corner or Least Cost.

Q2. In the MODI method, a transportation solution is optimal (for minimisation) when:

- A. All Δ_{ij} values for unoccupied cells are ≥ 0
- B. All Δ_{ij} values are negative
- C. There are no occupied cells
- D. Total cost equals zero

Answer: A

Non-negative opportunity costs (Δ_{ij}) for all unoccupied cells confirm no further cost reduction is possible — the solution is optimal.

Q3. If total supply does not equal total demand in a transportation problem, the correct approach is to:

- A. Discard the problem as unsolvable
- B. Add a dummy source or destination with zero cost to balance it
- C. Randomly adjust actual supply figures
- D. Ignore the imbalance

Answer: B

A dummy row/column with zero transportation cost balances supply and demand, allowing standard solution methods to be applied.

Q4. The number of basic (occupied) cells required for a non-degenerate transportation solution with m sources and n destinations is:

- A. $m \times n$
- B. $m + n$
- C. $m + n - 1$
- D. $m - n$

Answer: C

A non-degenerate basic feasible solution has exactly $m+n-1$ occupied cells, matching the number of independent constraints.

Q5. In the Assignment problem's Hungarian method, after row and column reduction, the minimum number of lines needed to cover all zeros should equal:

- A. The number of rows minus 1
- B. The order (n) of the matrix, for an optimal assignment to exist
- C. Always 1
- D. Twice the order of the matrix

Answer: B

When the minimum number of covering lines equals the matrix order (n), a complete one-to-one optimal assignment is achievable.

Q6. To convert a maximisation Assignment problem into a minimisation problem, each cell value is transformed by:

- A. Adding the matrix's largest value
- B. Subtracting each value from the matrix's largest value
- C. Multiplying by -1 only
- D. Dividing by the matrix's smallest value

Answer: B

New Value = Largest Value in Matrix – Original Value converts a maximisation problem into an equivalent minimisation problem.

Q7. A saddle point in a two-person zero-sum game exists when:

- A. Maximin value equals Minimax value
- B. Maximin value is always less than Minimax value
- C. There is no unique optimal strategy
- D. The game has more than two players

Answer: A

A saddle point (pure strategy equilibrium) exists exactly when the row player's maximin equals the column player's minimax.

Q8. When no saddle point exists in a 2x2 game, the players should use:

- A. A single pure strategy always
- B. A mixed strategy, randomising between their available strategies with specific probabilities
- C. No strategy at all
- D. Only the highest-payoff strategy regardless of the opponent

Answer: B

Without a saddle point, optimal play requires randomising strategies according to calculated probabilities to guarantee the game's value.

Q9. The Principle of Dominance in game theory is used to:

- A. Increase the size of the payoff matrix
- B. Eliminate strategies that are never better than an alternative, reducing the matrix size
- C. Guarantee a saddle point always exists
- D. Calculate transportation costs

Answer: B

Dominance eliminates strategies that are always inferior (or equal) to another strategy for a player, simplifying the game before solving.

Q10. For payoff matrix $[[6,2],[3,7]]$, the Maximin and Minimax values are:

- A. Maximin=3, Minimax=6
- B. Maximin=2, Minimax=7
- C. Maximin=6, Minimax=3
- D. Maximin=7, Minimax=2

Answer: A

Row minimums: Row1= $\min(6,2)=2$, Row2= $\min(3,7)=3 \rightarrow$ Maximin=3. Column maximums: Col1= $\max(6,3)=6$, Col2= $\max(2,7)=7 \rightarrow$ Minimax=6.

Q11. A degenerate transportation solution is one where:

- A. Occupied cells exceed $m+n-1$
- B. Occupied cells are fewer than $m+n-1$

- C. The solution is automatically optimal
- D. Supply always exceeds demand

Answer: B

Degeneracy occurs when the number of basic (occupied) cells falls short of $m+n-1$, requiring a small allocation (ϵ) to proceed with MODI.

Q12. The Assignment problem is a special case of which broader class of optimisation problem?

- A. Game Theory problem
- B. Transportation problem (with all supplies and demands equal to 1)
- C. Simulation model
- D. Regression analysis

Answer: B

The Assignment problem is a special, balanced transportation problem where each source supplies exactly 1 unit and each destination demands exactly 1 unit.

Q13. In VAM, the "penalty" for each row/column is calculated as:

- A. The sum of all costs in that row/column
- B. The difference between the two lowest costs in that row/column
- C. The highest cost in that row/column
- D. Always zero

Answer: B

VAM's penalty highlights the opportunity cost of not allocating to the cheapest cell in each row/column, guiding smarter initial allocation.

Q14. If the value of a game is zero (fair game), it implies:

- A. Neither player has an advantage over the other under optimal play
- B. One player always wins
- C. The game cannot be solved
- D. Both players get the maximum possible payoff

Answer: A

A zero game value means the game is fair — neither player gains a systematic advantage when both play their optimal strategies.

Q15. For an unbalanced Assignment problem (unequal number of jobs and workers), the correct approach is to:

- A. Refuse to solve it
- B. Add dummy job(s) or worker(s) with zero cost to balance the matrix before applying the Hungarian method
- C. Multiply all costs by the difference
- D. Assign randomly without any method

Answer: B

Adding dummy rows/columns with zero cost balances the matrix, after which the standard Hungarian method can be applied.

Simulation, Network Analysis (PERT/CPM) & Learning Curve

Monte Carlo simulation for probabilistic problems, project scheduling using PERT/CPM (critical path, floats, crashing), and the Learning Curve effect on labour cost.

1. Formulas

A. Network Analysis — PERT/CPM

PERT — Expected Activity Time

$$t_e = (t_o + 4t_m + t_p) / 6$$

t_o = optimistic time, t_m = most likely time, t_p = pessimistic time. Based on the Beta probability distribution.

PERT — Variance of Activity Time

$$\sigma^2 = [(t_p - t_o) / 6]^2$$

Variance of the critical path = sum of variances of all activities lying on the critical path (used to estimate project completion probability via the normal distribution).

Total Float (Slack)

$$\text{Total Float} = \text{Latest Start (LS)} - \text{Earliest Start (ES)} = \text{Latest Finish (LF)} - \text{Earliest Finish (EF)}$$

Activities on the Critical Path have ZERO total float — any delay in them delays the entire project.

Critical Path

Critical Path = The longest path (by duration) through the network from start to finish

Determines the minimum possible project completion time; all its activities have zero float.

CPM — Cost Slope (for Crashing)

$$\text{Cost Slope} = (\text{Crash Cost} - \text{Normal Cost}) / (\text{Normal Time} - \text{Crash Time})$$

To reduce project duration at minimum extra cost, crash the critical activity with the LOWEST cost slope first.

B. Learning Curve

Learning Curve Model

$$Y = a \times X^b, \text{ where } b = \log(\text{Learning Rate } \%) / \log(2)$$

Y = average time (or cost) per unit for X cumulative units; a = time for the 1st unit; b is negative for learning rate < 100%.

80% Learning Curve Rule (common exam case)

Cumulative average time per unit falls by 20% every time cumulative output DOUBLES

E.g., if unit 1 takes 100 hrs, cumulative average for 2 units = 80 hrs, for 4 units = 64 hrs, for 8 units = 51.2 hrs, and so on.

Incremental (Marginal) Unit Time

$$\text{Time for } n\text{th unit} = (\text{Total time for } n \text{ units}) - (\text{Total time for } n-1 \text{ units})$$

Total time for n units = Cumulative Average Time per unit (at n) $\times n$.

C. Simulation

Monte Carlo Simulation — Random Number Assignment

Assign a Random Number Range to each outcome, proportional to its Cumulative Probability

Random numbers are then drawn (from tables or generated) to simulate a large number of trials and estimate expected outcomes (e.g., average demand, waiting time).

2. Practical Application

Critical Path identification: Always compute ES/EF (forward pass) and LS/LF (backward pass) for every activity — the critical path is the chain of activities where ES=LS and EF=LF (zero float) throughout.

Crashing decisions: Only crash activities ON the critical path — crashing a non-critical activity wastes money without shortening the project, and crashing may create a NEW critical path once the original one is shortened enough.

Learning curve in budgeting: Apply the learning curve to labour-cost budgets for new products/processes with repetitive manual tasks — ignoring it typically overstates budgeted labour cost and understates achievable margins as workers gain experience.

3. Worked Illustrations

Illustration 8.1 — PERT Expected Time & Variance

An activity has: Optimistic time = 4 days, Most Likely time = 7 days, Pessimistic time = 16 days.

How to Read This Problem: A PERT question giving three time estimates (optimistic, most likely, pessimistic) for an activity — this is testing the weighted-average expected time formula, and often a follow-up variance calculation feeding into overall project risk.

Solution Approach: Apply the $t_e = (t_o + 4t_m + t_p)/6$ formula directly for expected time. If variance is also asked, use $[(t_p - t_o)/6]^2$ separately — don't confuse the two formulas, since one uses all three estimates and the other uses only the two extremes.

STEP-BY-STEP SOLUTION

Step 1 — Expected time: $t_e = (4 + 4 \times 7 + 16)/6 = (4 + 28 + 16)/6 = 48/6 = 8$ days

Step 2 — Variance: $\sigma^2 = [(16 - 4)/6]^2 = [12/6]^2 = 2^2 = 4$

Interpretation: Expected activity duration = 8 days, with a variance of 4 (Standard Deviation = 2 days) — this variance feeds into estimating the probability of overall project completion by a target date.

Illustration 8.2 — 80% Learning Curve

The first unit of a new product takes 200 labour hours. The workforce experiences an 80% learning curve.

How to Read This Problem: A Learning Curve question giving the first unit's time and a stated learning rate (e.g., 80%) — the key insight is that the rate applies to CUMULATIVE AVERAGE time each time cumulative output DOUBLES, not to each individual unit's time directly.

Solution Approach: Work in doubling steps: cumulative average time at 2 units = first-unit time $\times$ learning rate; at 4 units = that result $\times$ learning rate again; and so on. To find the time for a SPECIFIC batch of units (e.g., units 3-4), find total time at each cumulative point and subtract.

STEP-BY-STEP SOLUTION

Step 1 — Cumulative average time for 2 units: $200 \times 80\% = 160$ hours/unit; Total for 2 units = 320 hours

Step 2 — Cumulative average time for 4 units: $160 \times 80\% = 128$ hours/unit; Total for 4 units = 512 hours

Step 3 — Time for units 3 & 4 combined (incremental): Total(4 units) – Total(2 units) = $512 - 320 = 192$ hours

Interpretation: While the first 2 units together take 320 hours, units 3 and 4 combined take only 192 hours — demonstrating the efficiency gain from learning as cumulative output doubles.

4. Practice MCQs (15 × 2 Marks)

Q1. In PERT, the expected time formula $t_e = (t_o + 4t_m + t_p)/6$ is based on which probability distribution?

- A. Normal distribution
- B. Beta distribution
- C. Poisson distribution
- D. Binomial distribution

Answer: B

PERT's weighted-average time formula is derived from the properties of the Beta probability distribution.

Q2. Activities on the Critical Path have a Total Float equal to:

- A. A large positive number
- B. Zero
- C. A negative number
- D. Equal to the project duration

Answer: B

Critical path activities have zero slack — any delay directly delays the entire project.

Q3. In CPM crashing, to reduce project duration at minimum extra cost, the manager should first crash the critical activity with the:

- A. Highest cost slope
- B. Lowest cost slope
- C. Longest normal time
- D. Shortest crash time

Answer: B

Cost slope represents the extra cost per unit time saved — crashing the lowest-cost-slope activity first minimises total crashing cost.

Q4. Under an 80% learning curve, when cumulative output doubles, the cumulative AVERAGE time per unit:

- A. Increases by 20%
- B. Falls to 80% of its previous level (a 20% reduction)
- C. Remains unchanged
- D. Doubles

Answer: B

An 80% learning rate means cumulative average time per unit becomes 80% of its prior value every time output doubles.

Q5. Monte Carlo Simulation uses random numbers primarily to:

- A. Guarantee a single, deterministic outcome
- B. Model and replicate the probabilistic behaviour of uncertain variables over many trials
- C. Eliminate the need for probability distributions
- D. Calculate depreciation

Answer: B

Simulation generates random numbers mapped to probability distributions to model uncertain variables across many repeated trials.

Q6. The Critical Path in a project network is defined as:

- A. The shortest path from start to finish
- B. The longest path from start to finish, determining minimum project duration
- C. Any random path through the network
- D. The path with the fewest activities

Answer: B

The critical path is the longest sequence of dependent activities, setting the minimum time in which the project can be completed.

Q7. If an activity's optimistic time = 2 days, most likely = 5 days, pessimistic = 8 days, its expected time is:

- A. 4 days
- B. 5 days
- C. 6 days
- D. 8 days

Answer: B

$t_e = (2+4 \times 5+8)/6 = (2+20+8)/6 = 30/6 = 5$ days.

Q8. Total Float for a non-critical activity is generally:

- A. Always negative
- B. Zero
- C. Positive, representing the allowable delay without affecting overall project completion
- D. Equal to the activity's total duration

Answer: C

Non-critical activities have positive float/slack, meaning they can be delayed by that amount without extending the project.

Q9. The learning curve effect is most relevant for:

- A. Fully automated processes with no human labour input
- B. Repetitive manual tasks where workers gain efficiency through practice
- C. One-off tasks never repeated
- D. Raw material purchase costs only

Answer: B

Learning curves apply where repeated performance of a manual/labour-intensive task leads to measurable efficiency gains over time.

Q10. If Crash Cost = ₹5,000, Normal Cost = ₹3,000, Normal Time = 10 days, Crash Time = 8 days, the Cost Slope is:

- A. ₹500/day
- B. ₹1,000/day
- C. ₹2,000/day
- D. ₹250/day

Answer: B

Cost Slope = $(5,000-3,000)/(10-8) = 2,000/2 = ₹1,000$ per day.

Q11. The variance of the overall project completion time (for the critical path) is calculated as:

- A. The variance of only the longest single activity
- B. The sum of the variances of all activities lying on the critical path
- C. The average of all activity variances in the network
- D. Always zero

Answer: B

Since critical path activities are assumed independent, their individual variances are summed to get the total project time variance.

Q12. A key limitation of simulation as a decision-making technique is that it:

- A. Always gives the exact optimal solution
- B. Provides an approximate answer based on repeated trials, not a guaranteed optimum
- C. Cannot be used with probability distributions
- D. Requires no computational effort

Answer: B

Simulation approximates likely outcomes through repeated random trials — it does not mathematically guarantee the single best (optimal) solution like LP does.

Q13. If crashing the critical path activities reduces the project duration sufficiently, it is possible that:

- A. No other path can ever become critical
- B. A previously non-critical path may become the new critical path
- C. The project duration will always remain the same
- D. All floats become negative

Answer: B

As the original critical path shortens through crashing, another path's duration may equal or exceed it, making it the new critical path.

Q14. In the learning curve formula $Y = aX^b$, the exponent "b" is:

- A. Always positive
- B. Negative, reflecting decreasing time/cost per unit as cumulative output rises
- C. Always equal to 1
- D. Unrelated to the learning rate

Answer: B

Since learning reduces average time per unit as output rises, $b = \log(\text{learning rate})/\log(2)$ is negative for learning rates below 100%.

Q15. PERT is generally more suitable than CPM when:

- A. Activity times are known with certainty
- B. Activity times are uncertain and best represented by three time estimates (optimistic, most likely, pessimistic)
- C. There is no need for a project network at all
- D. Only cost data is available, with no time estimates

Answer: B

PERT was developed for projects with uncertain/probabilistic activity durations, using three-point time estimates, unlike CPM's deterministic single-time-estimate approach.

Business Application of Maxima & Minima

Using differential calculus to find profit-maximising output levels and cost-minimising decisions — marginal analysis and the first/second derivative tests.

1. Formulas

Marginal Cost & Marginal Revenue

Marginal Cost (MC) = $d(\text{Total Cost})/dQ$; Marginal Revenue (MR) = $d(\text{Total Revenue})/dQ$

MC and MR represent the rate of change of total cost/revenue with respect to one additional unit of output (Q).

Profit Maximisation — First Order Condition

Profit (π) = TR – TC. Maximised where: $d\pi/dQ = 0 \Rightarrow MR = MC$

The classic economic rule: profit is maximised at the output level where marginal revenue equals marginal cost.

Second Order Condition (confirming a Maximum)

$d^2\pi/dQ^2 < 0$ confirms a MAXIMUM (not a minimum) at that output level

If $d^2\pi/dQ^2 > 0$, the point found is a minimum instead — always check the second derivative's sign.

Cost Minimisation

Minimise Total Cost: $dTC/dQ = 0$ with $d^2TC/dQ^2 > 0$ confirming a minimum

Commonly applied to derive the Economic Order Quantity (EOQ) by minimising Total Inventory Cost (ordering + carrying cost) with respect to order size.

Economic Order Quantity (via Calculus)

$EOQ = \sqrt{(2DS / Cc)}$

D = annual demand, S = ordering cost per order, Cc = carrying cost per unit p.a. — derived by minimising Total Cost = $(D/Q)S + (Q/2)Cc$ with respect to Q.

2. Practical Application

MR=MC rule in pricing: Used to derive optimal selling price/output when demand and cost functions are given as equations of Q (e.g., $P = a - bQ$) — differentiate TR and TC, set equal, solve for Q, then find price from the demand equation.

Always confirm maximum vs minimum: Exam solutions frequently lose marks by finding a stationary point (first derivative = 0) but forgetting to check the second derivative's sign to confirm it's actually a maximum (for profit) or minimum (for cost).

EOQ link to inventory decisions: The calculus-based derivation of EOQ reinforces WHY the formula balances ordering cost (falls as Q rises) against carrying cost (rises as Q rises) — useful for explaining the concept, not just applying the formula.

3. Worked Illustration

Illustration 9.1 — Profit Maximisation using Calculus

Demand function: $P = 500 - 2Q$. Total Cost function: $TC = 100Q + 5,000$.

How to Read This Problem: A calculus-based profit maximisation question giving a demand function and a total cost function — the moment you see functions of Q rather than fixed numbers, that's your signal this is a differentiation problem, not an ordinary CVP question.

Solution Approach: Derive Total Revenue by multiplying price by Q , form the profit function ($TR-TC$), differentiate once and set to zero to find the candidate output level, then differentiate a SECOND time to confirm it's a maximum (negative second derivative) rather than a minimum.

STEP-BY-STEP SOLUTION

Step 1 — Total Revenue: $TR = P \times Q = (500-2Q)Q = 500Q - 2Q^2$

Step 2 — Profit function: $\pi = TR - TC = (500Q-2Q^2) - (100Q+5,000) = 400Q - 2Q^2 - 5,000$

Step 3 — First derivative, set to zero: $d\pi/dQ = 400 - 4Q = 0 \Rightarrow Q = 100 \text{ units}$

Step 4 — Second derivative check: $d^2\pi/dQ^2 = -4 < 0 \rightarrow$ confirms MAXIMUM

Step 5 — Optimal Price & Maximum Profit: $P = 500 - 2(100) = ₹300$; $\pi = 400(100) - 2(100)^2 - 5,000 = 40,000 - 20,000 - 5,000 = ₹15,000$

Interpretation: Profit is maximised at an output of 100 units, sold at a price of ₹300 per unit, generating maximum profit of ₹15,000.

4. Practice MCQs (15 × 2 Marks)

Q1. Profit is maximised at the output level where:

- A. Total Revenue is maximised regardless of cost
- B. Marginal Revenue equals Marginal Cost (and the second derivative of profit is negative)
- C. Total Cost is minimised regardless of revenue
- D. Average Cost equals Marginal Cost only

Answer: B

The $MR=MC$ rule (with the second-order condition $d^2\pi/dQ^2 < 0$) is the standard calculus-based profit maximisation condition.

Q2. If $d^2\pi/dQ^2 > 0$ at a stationary point where $d\pi/dQ=0$, this point represents:

- A. A maximum profit point
- B. A minimum profit point (not what we want for maximisation)
- C. An inflection point always
- D. An undefined point

Answer: B

A positive second derivative at a stationary point indicates a minimum, not the maximum we seek in a profit-maximisation problem.

Q3. Marginal Cost is defined mathematically as:

- A. Total Cost divided by total output
- B. The derivative of Total Cost with respect to output (dTC/dQ)
- C. Fixed Cost per unit
- D. Average Variable Cost

Answer: B

MC is the rate of change of total cost as output changes — mathematically, the first derivative of TC with respect to Q .

Q4. If $TR = 300Q - 3Q^2$, Marginal Revenue is:

- A. $300 - 3Q$
- B. $300 - 6Q$
- C. $300Q - 6Q$
- D. $600Q$

Answer: B

$MR = d(TR)/dQ = d(300Q-3Q^2)/dQ = 300 - 6Q$.

Q5. In deriving the EOQ formula via calculus, Total Inventory Cost is minimised by differentiating with respect to:

- A. Time
- B. Order Quantity (Q)
- C. Annual Demand (D) only
- D. Carrying Cost Rate only

Answer: B

EOQ is found by setting $d(\text{Total Cost})/dQ = 0$, where Total Cost = ordering cost + carrying cost, both expressed as functions of Q.

Q6. If Total Cost $TC = Q^2 - 20Q + 500$, the output level that minimises cost is:

- A. $Q=5$
- B. $Q=10$
- C. $Q=20$
- D. $Q=25$

Answer: B

$dTC/dQ = 2Q - 20 = 0 \Rightarrow Q=10$. Second derivative = $2 > 0$, confirming a minimum.

Q7. Why must the second derivative always be checked after finding a stationary point in these business optimisation problems?

- A. It's an optional formality with no real purpose
- B. To confirm whether the stationary point is actually a maximum or a minimum
- C. It only matters for linear functions
- D. It replaces the need for the first derivative entirely

Answer: B

Setting the first derivative to zero only locates a stationary point — the second derivative's sign confirms whether it's a maximum, minimum, or neither.

Q8. At the profit-maximising output level, if $MR > MC$ just before that point, it implies:

- A. Producing more units would increase profit further, up to the point where $MR=MC$
- B. The firm should immediately stop production
- C. Profit is already at its maximum
- D. Total cost is negative

Answer: A

As long as MR exceeds MC, each additional unit adds more revenue than cost, increasing profit — production should continue until $MR=MC$.

Q9. Given Demand: $P = 200 - 4Q$ and $TC = 20Q$, the profit-maximising quantity Q is:

- A. 10
- B. 20
- C. 22.5
- D. 45

Answer: C

$TR=200Q-4Q^2$; $\pi=200Q-4Q^2-20Q=180Q-4Q^2$. $d\pi/dQ=180-8Q=0 \Rightarrow Q=22.5$.

Q10. The classical EOQ model assumes Total Cost consists of:

- A. Only ordering cost
- B. Ordering cost and carrying (holding) cost, which trade off against each other as order quantity changes
- C. Only carrying cost
- D. Selling price and profit margin only

Answer: B

EOQ balances ordering cost (which falls with larger, less-frequent orders) against carrying cost (which rises with larger average inventory).

Q11. If a firm's profit function is $\pi = 100Q - Q^2 - 500$, the maximum profit achievable is:

- A. ₹1,500
- B. ₹2,000
- C. ₹2,500
- D. ₹5,000

Answer: B

$d\pi/dQ = 100 - 2Q = 0 \Rightarrow Q = 50$. $\pi = 100(50) - (50)^2 - 500 = 5,000 - 2,500 - 500 = ₹2,000$. Second derivative $= -2 < 0$ confirms maximum.

Q12. Marginal Revenue at any output level can also be interpreted as:

- A. The average revenue per unit sold
- B. The additional revenue generated from selling one more unit
- C. The total revenue for all units combined
- D. The fixed component of revenue

Answer: B

MR measures the incremental revenue impact of selling exactly one additional unit of output.

Q13. In business applications, calculus-based maxima/minima techniques are used mainly for:

- A. Recording historical transactions
- B. Optimising continuous decision variables like output level, price, or order quantity
- C. Preparing statutory financial statements
- D. Auditing procedures

Answer: B

Calculus optimisation is applied where a continuous variable (Q, price, order size) needs to be set at its profit-maximising or cost-minimising level.

Q14. If Average Cost (AC) is minimised, at that output level AC equals:

- A. Fixed Cost
- B. Marginal Cost
- C. Total Revenue
- D. Zero

Answer: B

At the output level where Average Cost is at its minimum, $AC = MC$ (a standard result from differentiating the AC function).

Q15. A firm facing demand $P=a-bQ$ maximises revenue (not profit) at the output level where:

- A. $MR = MC$
- B. $MR = 0$
- C. Price = Marginal Cost
- D. Total Cost = 0

Answer: B

Revenue (not profit) maximisation occurs where the derivative of TR with respect to Q equals zero, i.e., $MR=0$ — a distinct condition from profit maximisation ($MR=MC$).

Business Forecasting (Time Series & Regression) & Data Analytics

Regression analysis for forecasting, time series decomposition (trend, seasonal, cyclical, irregular), and an introduction to data analytics tools used in modern cost management.

1. Formulas

Simple Linear Regression Line

$$Y = a + bX$$

Y = dependent (forecast) variable, X = independent variable, a = intercept, b = slope (regression coefficient).

Regression Coefficient "b" (Least Squares)

$$b = [n\sum XY - \sum X \sum Y] / [n\sum X^2 - (\sum X)^2]$$

n = number of paired observations. Minimises the sum of squared deviations of actual Y from the fitted line.

Regression Constant "a"

$$a = (\sum Y - b\sum X) / n = \bar{Y} - \bar{b}X$$

Ensures the regression line passes through the point of means (mean of X, mean of Y).

Coefficient of Correlation (r)

$$r = [n\sum XY - \sum X \sum Y] / \sqrt{[n\sum X^2 - (\sum X)^2][n\sum Y^2 - (\sum Y)^2]}$$

Ranges from -1 to +1. Coefficient of Determination = r^2 = proportion of variation in Y explained by X.

Time Series — Multiplicative Model

$$Y = T \times S \times C \times I$$

Y=actual value, T=Trend, S=Seasonal, C=Cyclical, I=Irregular component. (Additive model: $Y = T + S + C + I$ is used as an alternative when fluctuations don't scale with the trend level.)

Seasonal Index

$$\text{Seasonal Index} = (\text{Average value for that season} / \text{Overall average of all seasons}) \times 100$$

An index of 100 = no seasonal effect; above 100 = above-average season; below 100 = below-average season.

Trend by Moving Averages

Moving Average (period n) = Average of n consecutive time-period values, rolled forward one period at a time

Smooths out short-term/seasonal fluctuations to reveal the underlying trend — choose n to match the length of the seasonal cycle (e.g., 4 for quarterly data, 12 for monthly data).

2. Practical Application

Regression for cost estimation: Widely used to split semi-variable costs into fixed and variable elements (High-Low method is a simplified 2-point version; regression uses ALL data points for a statistically better fit).

Interpreting r^2 : An r^2 of 0.85 means 85% of the variation in the dependent variable (e.g., total cost) is explained by the independent variable (e.g., output level) — useful for judging how reliable a cost/sales forecast is likely to be.

Data Analytics in cost management: Modern SCM increasingly uses descriptive (what happened), diagnostic (why), predictive (what will happen), and prescriptive (what should we do) analytics — moving cost management from historical reporting toward forward-looking decision support.

3. Worked Illustration

Illustration 10.1 — Simple Linear Regression for Cost Forecasting

Output (X, '000 units) and Total Cost (Y, ₹'000) for 5 months: (2,20), (4,28), (6,34), (8,40), (10,48).

How to Read This Problem: A regression-based cost forecasting question giving paired output and total cost data across several periods — recognise this as a least-squares regression problem, more robust than a simple two-point High-Low calculation.

Solution Approach: Build the ΣX , ΣY , ΣXY , and ΣX^2 summation table methodically first (errors here cascade into everything else), then apply the 'b' and 'a' formulas in that order, since 'a' depends on already knowing 'b'. Use the resulting equation to forecast at the requested output level.

STEP-BY-STEP SOLUTION

X	Y	XY	X ²
2	20	40	4
4	28	112	16
6	34	204	36
8	40	320	64
10	48	480	100

Step 1 — Sums (n=5): $\Sigma X=30$, $\Sigma Y=170$, $\Sigma XY=1,156$, $\Sigma X^2=220$

Step 2 — Regression coefficient b: $b = [5(1,156) - (30)(170)] / [5(220) - (30)^2] = [5,780 - 5,100] / [1,100 - 900] = 680/200 = 3.4$

Step 3 — Regression constant a: $a = (170 - 3.4 \times 30) / 5 = (170 - 102) / 5 = 68/5 = 13.6$

Step 4 — Regression equation & forecast: $Y = 13.6 + 3.4X$. For $X=12$ ('000 units): $Y = 13.6 + 3.4(12) = 13.6 + 40.8 = ₹54.4$ thousand

Interpretation: Fixed cost component $\approx ₹13,600$ (the "a" value), variable cost $\approx ₹3.40$ per unit ("b" value, since X is in '000 units and Y in ₹'000, effectively ₹3.40/unit). Forecast total cost at 12,000 units output $\approx ₹54,400$.

4. Practice MCQs (15 × 2 Marks)

Q1. In the regression line $Y = a + bX$, the coefficient "b" represents:

- A. The Y-intercept (fixed component)
- B. The slope — the average change in Y for a one-unit change in X
- C. The total sum of Y values
- D. The correlation coefficient

Answer: B

"b" is the slope of the regression line, representing the rate of change of the dependent variable per unit change in the independent variable.

Q2. The Coefficient of Determination (r^2) represents:

- A. The slope of the regression line
- B. The proportion of variation in the dependent variable explained by the independent variable
- C. The Y-intercept
- D. The total number of observations

Answer: B

r^2 measures how much of the variability in Y is statistically explained by X — a higher r^2 indicates a better-fitting model.

Q3. In time series analysis, the "Seasonal" component refers to:

- A. Long-term upward or downward movement
- B. Regular, periodic fluctuations tied to the calendar (e.g., quarters, months)
- C. Random, unpredictable events
- D. Long-duration business cycle swings

Answer: B

Seasonal variation is a regular, calendar-linked pattern (e.g., higher ice cream sales in summer) recurring within each year.

Q4. The Multiplicative Time Series Model is expressed as:

- A. $Y = T + S + C + I$
- B. $Y = T \times S \times C \times I$
- C. $Y = T/S/C/I$
- D. $Y = T - S - C - I$

Answer: B

The multiplicative model expresses the actual value as the product of Trend, Seasonal, Cyclical, and Irregular components.

Q5. A Seasonal Index of 120 for a particular quarter means:

- A. That quarter's value is 120% below the overall average
- B. That quarter's value is typically 20% above the overall average
- C. There is no seasonal effect
- D. Sales are exactly zero in that quarter

Answer: B

A Seasonal Index above 100 indicates the season's typical value exceeds the overall average — 120 means 20% above average.

Q6. The Moving Averages method for trend estimation works by:

- A. Using only the first and last data points
- B. Averaging a fixed number of consecutive periods, rolling forward one period at a time, to smooth out short-term fluctuations
- C. Ignoring all data points except the mean
- D. Using only the highest value in the series

Answer: B

Moving averages smooth a time series by averaging over a rolling window, reducing the impact of seasonal/random noise to reveal the trend.

Q7. If the correlation coefficient $r = 0.9$, the coefficient of determination r^2 equals:

- A. 0.81 (81%)
- B. 0.90 (90%)
- C. 0.09 (9%)
- D. 1.80 (180%)

Answer: A

$r^2 = 0.9^2 = 0.81$, meaning 81% of the variation in Y is explained by X.

Q8. Regression analysis is preferred over the High-Low method for cost estimation mainly because regression:

- A. Uses only two extreme data points
- B. Uses ALL available data points, giving a statistically more reliable fixed-variable cost split
- C. Ignores all data except the median
- D. Cannot be used for cost estimation at all

Answer: B

Regression incorporates every observation, reducing the distortion risk from relying on just the highest and lowest points (as the High-Low method does).

Q9. The "Cyclical" component in time series analysis refers to:

- A. Fluctuations tied strictly to the calendar year
- B. Longer-term, wave-like fluctuations often linked to overall business/economic cycles
- C. Completely random, unpredictable events like strikes

D. Only the long-term linear trend

Answer: B

Cyclical variations are longer-duration swings (often several years), typically associated with broader economic booms and recessions, unlike the shorter, calendar-linked seasonal component.

Q10. Predictive analytics, as a category of data analytics, focuses on:

- A. Describing what has already happened
- B. Forecasting what is likely to happen in the future using historical data and models
- C. Recommending specific prescribed actions
- D. Only auditing past transactions

Answer: B

Predictive analytics uses historical data, statistics, and modelling techniques to forecast future outcomes.

Q11. "Prescriptive Analytics" goes a step further than predictive analytics by:

- A. Only describing past events
- B. Recommending specific actions to achieve a desired future outcome
- C. Ignoring forecasts entirely
- D. Only visualising raw data

Answer: B

Prescriptive analytics builds on predictions to suggest concrete recommended actions/decisions.

Q12. If $\Sigma X=50$, $\Sigma Y=250$, $n=5$, and $b=4$, the regression constant "a" is:

- A. 10
- B. 30
- C. 50
- D. 90

Answer: A

$a = (\Sigma Y - b\Sigma X)/n = (250 - 4 \times 50)/5 = (250 - 200)/5 = 50/5 = 10.$

Q13. The Irregular (Random) component of a time series represents:

- A. Predictable seasonal swings
- B. Unpredictable, one-off variations (e.g., natural disasters, strikes) not explained by trend, seasonal, or cyclical factors
- C. The overall long-term trend
- D. Business cycle fluctuations only

Answer: B

Irregular variations are residual, non-systematic fluctuations caused by unforeseen one-off events.

Q14. A correlation coefficient close to 0 indicates:

- A. A strong linear relationship between the two variables
- B. Little to no linear relationship between the two variables
- C. A perfect negative relationship
- D. A perfect positive relationship

Answer: B

A correlation coefficient near zero suggests the two variables have little or no linear association.

Q15. In modern strategic cost management, tools for data analytics are primarily introduced to help managers:

- A. Replace all financial reporting with raw data dumps
- B. Extract actionable cost/business insights from large volumes of structured and unstructured data
- C. Eliminate the need for any cost accounting
- D. Only comply with statutory audit requirements

Answer: B

Data analytics tools help cost managers derive meaningful, actionable insights from big data to support more informed strategic decisions.

PART III · PAPER 20A (ELECTIVE)

Strategic Performance Management & Business Valuation (SPMBV)

Performance measurement & improvement tools, enterprise risk management, and the full business valuation toolkit (DCF, multiples, goodwill, M&A) — 9 modules, 135 MCQs.

2 Sections

9 Modules

135 MCQs

SECTION A

Strategic Performance Management

Weightage: 50% of total marks | Modules 1–4

Introduction to Performance Management

Performance, productivity & efficiency measurement; financial performance analysis; procurement-to-pay, order-to-cash, SCM/CRM cycles; customer profitability; corporate credit rating.

1. Formulas

Productivity

$$\text{Productivity} = \text{Output} / \text{Input}$$

Can be measured for a single input (partial productivity, e.g., labour productivity = Output/Labour hours) or all inputs combined (total factor productivity).

Efficiency

$$\text{Efficiency (\%)} = \frac{\text{Actual (Standard) Output}}{\text{Actual Input Used}} \times 100 \text{ [or] } \frac{\text{Standard Time for Actual Output}}{\text{Actual Time Taken}} \times 100$$

Efficiency measures how well resources are converted to output relative to a benchmark/standard.

Days Payable Outstanding (DPO) — Procure-to-Pay

$$\text{DPO} = \left(\frac{\text{Average Accounts Payable}}{\text{COGS or Purchases}} \right) \times 365$$

A higher DPO means the firm takes longer to pay suppliers — improves the firm's own cash position but can strain vendor relationships if excessive.

Days Sales Outstanding (DSO) — Order-to-Cash

$$\text{DSO} = \left(\frac{\text{Average Accounts Receivable}}{\text{Credit Sales}} \right) \times 365$$

Measures how quickly the firm collects cash from customers after a sale — a key CRM/order-to-cash efficiency metric.

Days Inventory Outstanding (DIO)

$$\text{DIO} = \left(\frac{\text{Average Inventory}}{\text{COGS}} \right) \times 365$$

Measures how long inventory is held before being sold — part of the supply chain performance picture.

Cash Conversion Cycle (CCC)

$$\text{CCC} = \text{DIO} + \text{DSO} - \text{DPO}$$

The number of days cash is tied up in the operating cycle — a shorter CCC (or even negative, as with some retailers) is generally more efficient.

Customer Profitability Analysis

$$\text{Customer Profit} = \text{Revenue from Customer} - (\text{Cost of Goods/Services Sold} + \text{Cost-to-Serve that customer})$$

"Cost-to-serve" includes order processing, delivery, returns handling, and support specific to that customer/segment — often reveals that some "high-revenue" customers are actually unprofitable.

2. Practical Application

Cash Conversion Cycle management: Firms improve CCC by simultaneously reducing DIO (faster inventory turnover), reducing DSO (faster collections), and increasing DPO (slower, but not excessively strained, payments) — a classic working-capital efficiency lever.

Customer profitability insights: Applying activity-based costing principles to customers (not just products) often shows that a small % of customers generate a disproportionate share of profit, while some large-revenue customers are loss-making once cost-to-serve is factored in.

Reverse mapping using data analytics: Involves working backward from market/customer data (sales patterns, social sentiment, competitor moves) to refine or validate the firm's business strategy — a modern extension of traditional performance analysis.

3. Worked Illustration

Illustration 1.1 — Cash Conversion Cycle

Average Inventory = ₹40,00,000, COGS = ₹2,92,00,000; Average Receivables = ₹30,00,000, Credit Sales = ₹3,65,00,000; Average Payables = ₹25,00,000, Purchases = ₹2,50,00,000. (Use 365 days.)

How to Read This Problem: A working-capital efficiency question giving average inventory, receivables, and payables figures alongside COGS/sales/purchases — this is testing the three DIO/DSO/DPO building blocks before they're combined into the Cash Conversion Cycle.

Solution Approach: Compute each of the three day-metrics independently first, in the SAME order they'll be combined (DIO, DSO, DPO), then combine using $CCC = DIO + DSO - DPO$. Keep each intermediate figure clearly labelled so a sign error in the final combination is easy to spot.

STEP-BY-STEP SOLUTION

Step 1 — DIO: $(40,00,000 / 2,92,00,000) \times 365 = 50 \text{ days}$

Step 2 — DSO: $(30,00,000 / 3,65,00,000) \times 365 = 30 \text{ days}$

Step 3 — DPO: $(25,00,000 / 2,50,00,000) \times 365 = 36.5 \text{ days}$

Step 4 — Cash Conversion Cycle: $CCC = 50 + 30 - 36.5 = 43.5 \text{ days}$

Interpretation: Cash is tied up in the operating cycle for approximately 43.5 days — management could target reducing DIO (faster inventory turns) or negotiating longer supplier payment terms (higher DPO) to shorten this and free up working capital.

4. Practice MCQs (15 × 2 Marks)

Q1. Productivity is defined as:

- A. Output minus Input
- B. Output divided by Input
- C. Input divided by Output
- D. Output multiplied by Input

Answer: B

Productivity = Output/Input, measuring how efficiently resources are converted into output.

Q2. A rising Days Sales Outstanding (DSO) over time generally indicates:

- A. Faster collection from customers
- B. Slower collection from customers, tying up more cash in receivables
- C. Improved supplier relationships
- D. No effect on working capital

Answer: B

A rising DSO means it's taking longer, on average, to collect cash from credit sales, increasing the cash tied up in receivables.

Q3. Cash Conversion Cycle is computed as:

- A. $DIO + DSO + DPO$
- B. $DIO + DSO - DPO$
- C. $DIO - DSO - DPO$
- D. $DPO - DIO - DSO$

Answer: B

$CCC = \text{Days Inventory Outstanding} + \text{Days Sales Outstanding} - \text{Days Payable Outstanding}$.

Q4. A firm wanting to shorten its Cash Conversion Cycle should generally aim to:

- A. Increase DIO and DSO, decrease DPO
- B. Decrease DIO and DSO, increase DPO
- C. Increase all three metrics
- D. Decrease all three metrics

Answer: B

Faster inventory turnover (lower DIO), faster collections (lower DSO), and slower payments (higher DPO) all shorten the cash conversion cycle.

Q5. Customer Profitability Analysis often reveals that:

- A. All customers are equally profitable
- B. Some high-revenue customers may actually be unprofitable once cost-to-serve is considered
- C. Cost-to-serve is irrelevant to profitability
- D. Only product cost matters, never customer-specific costs

Answer: B

Once specific service, delivery, and support costs are allocated per customer, some seemingly valuable (high-revenue) customers can turn out to be net loss-making.

Q6. Days Payable Outstanding (DPO) measures:

- A. How quickly a firm collects cash from customers
- B. How long, on average, a firm takes to pay its suppliers
- C. How long inventory sits before being sold
- D. The firm's net profit margin

Answer: B

DPO reflects the average time taken to settle amounts owed to suppliers/creditors.

Q7. Order-to-Cash (O2C) process performance is most closely linked to which metric?

- A. Days Payable Outstanding
- B. Days Sales Outstanding
- C. Debt-Equity Ratio
- D. Fixed Asset Turnover

Answer: B

DSO directly measures the efficiency of the order-to-cash cycle — how quickly sales convert into actual cash collected.

Q8. Efficiency, as a performance measure, compares:

- A. Actual output to a standard or benchmark
- B. Only historical financial statements
- C. Two unrelated companies' balance sheets
- D. Tax rates across countries

Answer: A

Efficiency assesses actual performance against a standard/benchmark to gauge how well resources were utilised.

Q9. If Average Inventory = ₹20,00,000 and COGS = ₹1,46,00,000, DIO (365-day year) is approximately:

- A. 25 days
- B. 50 days
- C. 73 days
- D. 100 days

Answer: B

$DIO = (20,00,000 / 1,46,00,000) \times 365 \approx 50 \text{ days}$.

Q10. Vendor Relationship Management, as part of the Procure-to-Pay cycle, primarily focuses on:

- A. Managing customer complaints
- B. Building effective, mutually beneficial relationships with suppliers to ensure reliable, cost-effective procurement
- C. Setting employee salaries
- D. Preparing tax returns

Answer: B

Vendor relationship management aims to secure reliable supply, favourable terms, and quality from suppliers through structured, ongoing engagement.

Q11. Reverse mapping of business strategy using data analytics involves:

- A. Ignoring market data entirely when forming strategy
- B. Working backward from market/customer data to validate or refine business strategy
- C. Only using historical accounting data with no market input
- D. A purely manual, non-data-driven process

Answer: B

This approach uses real market-place signals (sales patterns, competitor behaviour, customer sentiment) to inform and adjust strategic direction.

Q12. A firm's corporate credit rating is generally improved by:

- A. Increasing debt without regard to earning capacity
- B. Strengthening financial ratios such as interest coverage, and maintaining consistent, transparent financial performance
- C. Delaying financial disclosures
- D. Ignoring cash flow management entirely

Answer: B

Rating agencies favour strong debt-servicing capacity (e.g., high interest coverage) and consistent, transparent financial performance.

Q13. Supply Chain Management (SCM), in the performance management context, primarily aims to:

- A. Maximise inventory holding at every stage
- B. Optimise the flow of goods, information, and finances from suppliers to end customers
- C. Eliminate all supplier relationships
- D. Focus solely on marketing activities

Answer: B

SCM coordinates and optimises the entire flow — materials, information, and money — from raw material sourcing through to final delivery.

Q14. If a company's cost-to-serve a large customer exceeds the gross margin earned from that customer, the customer is:

- A. Highly profitable
- B. Unprofitable, despite generating significant revenue
- C. Irrelevant to profitability analysis
- D. Automatically the most valuable customer

Answer: B

When cost-to-serve exceeds the margin earned, the customer relationship is a net drain on profitability despite the top-line revenue it generates.

Q15. A negative Cash Conversion Cycle (seen in some retail/e-commerce businesses) implies that:

- A. The firm collects cash from customers before it has to pay its suppliers
- B. The firm never collects cash from customers
- C. The firm has no inventory at all times
- D. It indicates financial distress always

Answer: A

A negative CCC means the firm effectively uses supplier credit to fund operations, since it collects from customers before paying suppliers — often a sign of strong bargaining power/efficient working capital management.

Performance Measurement, Evaluation & Improvement Tools

Balanced Scorecard, DuPont/RONA analysis, benchmarking, Six Sigma & Lean, Statistical Quality Control (SQC), and the PDCA cycle.

1. Formulas

DuPont Analysis (3-Step ROE Decomposition)

$$\text{ROE} = \text{Net Profit Margin} \times \text{Asset Turnover} \times \text{Equity Multiplier}$$

$$= (\text{Net Income}/\text{Sales}) \times (\text{Sales}/\text{Total Assets}) \times (\text{Total Assets}/\text{Equity})$$

Decomposes ROE into profitability, efficiency, and leverage drivers, showing WHERE a change in ROE is coming from.

RONA (Return on Net Assets)

$$\text{RONA} = \text{Net Income} / (\text{Fixed Assets} + \text{Net Working Capital})$$

Focuses specifically on the operating assets a division/manager actually controls, often used in the RONA model as an alternative to ROI/ROA.

Six Sigma — Defects Per Million Opportunities (DPMO)

$$\text{DPMO} = (\text{Number of Defects} / (\text{Number of Units} \times \text{Opportunities per Unit})) \times 1,000,000$$

A "Six Sigma" quality level corresponds to only 3.4 DPMO — an extremely low defect rate.

Statistical Quality Control (SQC) — Control Limits

$$\text{Upper Control Limit (UCL)} = \text{Mean} + 3\sigma; \text{Lower Control Limit (LCL)} = \text{Mean} - 3\sigma$$

A process is considered "in control" if sample observations fall within these $\pm 3\sigma$ limits on a control chart; points outside signal a special-cause variation needing investigation.

Benchmarking Gap

$$\text{Performance Gap} = \text{Benchmark (Best-in-Class) Performance} - \text{Own Current Performance}$$

Used to quantify the improvement opportunity relative to an internal, competitive, or best-in-class external benchmark.

2. Practical Application

Balanced Scorecard's four perspectives: Financial (shareholder value), Customer (satisfaction/retention), Internal Business Process (operational efficiency/quality), and Learning & Growth (employee skills, innovation capacity) — a holistic alternative to relying on financial measures alone.

DuPont for diagnosing ROE changes: If ROE has fallen, DuPont analysis pinpoints whether the cause is margin compression, declining asset efficiency, or reduced leverage — guiding a much more targeted management response than looking at ROE alone.

PDCA cycle in continuous improvement: Plan (identify improvement opportunity, set target) → Do (implement on a small/trial scale) → Check (measure results against target) → Act (standardise if successful, or adjust and repeat) — the foundation of Lean/Kaizen-style ongoing improvement.

3. Worked Illustrations

Illustration 2.1 — DuPont Analysis

Net Income = ₹50,00,000; Sales = ₹5,00,00,000; Total Assets = ₹2,50,00,000; Shareholders' Equity = ₹1,25,00,000.

How to Read This Problem: A DuPont decomposition question giving net income, sales, total assets, and equity — this tests whether you can build ROE from its three multiplicative drivers rather than just computing Net Income/Equity directly.

Solution Approach: Compute each of the three ratios (margin, turnover, leverage) separately first, then multiply them together and cross-check the result against a direct ROE calculation (Net Income/Equity) — the two should match exactly, which is a great error-catching step.

STEP-BY-STEP SOLUTION

Step 1 — Net Profit Margin: $50,00,000/5,00,00,000 = 10\%$

Step 2 — Asset Turnover: $5,00,00,000/2,50,00,000 = 2.0 \text{ times}$

Step 3 — Equity Multiplier: $2,50,00,000/1,25,00,000 = 2.0 \text{ times}$

Step 4 — ROE: $ROE = 10\% \times 2.0 \times 2.0 = 40\%$

Interpretation: ROE of 40% is driven equally by a healthy 10% profit margin, efficient asset utilisation (2x turnover), and moderate financial leverage (2x equity multiplier) — DuPont shows this is a balanced, not leverage-driven, ROE.

Illustration 2.2 — Six Sigma DPMO Calculation

A production line inspects 5,000 units, each with 4 critical quality characteristics (opportunities for defect). 40 total defects were found across all units.

How to Read This Problem: A Six Sigma DPMO question giving number of units, opportunities per unit, and total defects found — the trap here is forgetting to multiply units BY opportunities-per-unit before dividing, understating the true denominator.

Solution Approach: Compute total opportunities first (units $\times$ opportunities per unit), THEN divide defects by that total and multiply by 1,000,000. Compare your DPMO result against the 3.4 Six Sigma benchmark to frame your interpretation.

STEP-BY-STEP SOLUTION

Step 1 — Total Opportunities: $5,000 \text{ units} \times 4 \text{ opportunities/unit} = 20,000 \text{ total opportunities}$

Step 2 — DPMO: $DPMO = (40/20,000) \times 1,000,000 = 0.002 \times 1,000,000 = 2,000 \text{ DPMO}$

Interpretation: A DPMO of 2,000 corresponds to a "Four Sigma" quality level (approximately) — well short of the Six Sigma benchmark of 3.4 DPMO, indicating meaningful room for process improvement.

4. Practice MCQs (15 $\times$ 2 Marks)

Q1. The Balanced Scorecard evaluates organisational performance using which FOUR perspectives?

- A. Financial, Customer, Internal Business Process, Learning & Growth
- B. Only Financial and Customer
- C. Marketing, Sales, HR, IT
- D. Only quantitative financial ratios

Answer: A

Kaplan & Norton's Balanced Scorecard uses these four linked perspectives for a holistic view of performance beyond financial results alone.

Q2. Given the given information for a business — Asset turnover = 3.50, Equity multiplier = 1.00, ROE = 30% — the Net Profit Margin under DuPont analysis is:

- A. 5.87%
- B. 6.75%
- C. 7.65%
- D. 8.57%

Answer: D

$ROE = NPM \times \text{Asset Turnover} \times \text{Equity Multiplier} \Rightarrow 30\% = NPM \times 3.50 \times 1.00 \Rightarrow NPM = 30\%/3.50 = 8.57\%$.

Q3. RONA is calculated as Net Income divided by:

- A. Total Assets only
- B. Fixed Assets plus Net Working Capital
- C. Total Liabilities
- D. Sales Revenue

Answer: B

RONA focuses on the net operating assets actually deployed — Fixed Assets + Net Working Capital.

Q4. A Six Sigma quality level corresponds to a defect rate of approximately:

- A. 3.4 defects per million opportunities
- B. 34 defects per hundred opportunities
- C. 340 defects per thousand opportunities
- D. 3,400 defects per million opportunities

Answer: A

Six Sigma is defined as a process achieving only 3.4 defects per million opportunities (DPMO) — an extremely high quality standard.

Q5. In a Statistical Quality Control chart, the Upper and Lower Control Limits are typically set at:

- A. Mean $\pm$ 1 Standard Deviation
- B. Mean $\pm$ 2 Standard Deviations
- C. Mean $\pm$ 3 Standard Deviations
- D. Mean $\pm$ 6 Standard Deviations

Answer: C

Standard SQC control charts use $\pm 3\sigma$ limits around the process mean to distinguish normal (common-cause) variation from abnormal (special-cause) variation.

Q6. The PDCA cycle stands for:

- A. Plan-Do-Check-Act
- B. Produce-Deliver-Collect-Analyse
- C. Plan-Design-Control-Adjust
- D. Perform-Document-Certify-Approve

Answer: A

PDCA (Plan-Do-Check-Act) is the classic continuous improvement cycle used in quality management and Lean/Kaizen practices.

Q7. Benchmarking Performance Gap is calculated as:

- A. Own Performance – Benchmark Performance
- B. Benchmark Performance – Own Current Performance
- C. Benchmark Performance $\times$ Own Performance
- D. Own Performance / Benchmark Performance only, with no subtraction

Answer: B

The performance gap quantifies how far current performance lags the best-in-class or target benchmark.

Q8. Lean Management primarily focuses on:

- A. Maximising inventory buffers at every stage
- B. Eliminating waste (non-value-added activities) across processes to improve efficiency
- C. Increasing headcount regardless of workload
- D. Ignoring customer requirements

Answer: B

Lean management systematically identifies and eliminates various forms of waste (overproduction, waiting, defects, etc.) to streamline processes.

Q9. If a firm's Equity Multiplier increases while Net Profit Margin and Asset Turnover remain constant, ROE will:

- A. Decrease
- B. Increase, reflecting higher financial leverage

- C. Remain exactly the same
- D. Become negative

Answer: B

Since $ROE = NPM \times \text{Asset Turnover} \times \text{Equity Multiplier}$, a rise in the equity multiplier (more leverage) directly increases ROE, holding other factors constant.

Q10. Which of the following is NOT one of the four Balanced Scorecard perspectives?

- A. Financial
- B. Customer
- C. Shareholder Dividend Policy
- D. Learning & Growth

Answer: C

Dividend policy is not one of the four standard Balanced Scorecard perspectives (Financial, Customer, Internal Business Process, Learning & Growth).

Q11. Benchtrekking, as distinguished from simple benchmarking, involves:

- A. A one-time comparison only
- B. Tracking benchmark comparisons over time to observe trends in relative performance
- C. Ignoring competitor data entirely
- D. Only comparing internal departments, never external firms

Answer: B

Benchtrekking extends benchmarking by tracking how the performance gap evolves over multiple periods, revealing whether the firm is closing or widening the gap.

Q12. In DuPont analysis, "Asset Turnover" is calculated as:

- A. Net Income / Sales
- B. Sales / Total Assets
- C. Total Assets / Equity
- D. Net Income / Total Assets

Answer: B

Asset Turnover = Sales/Total Assets, measuring how efficiently assets generate revenue.

Q13. A process operating with data points regularly falling outside the $\pm 3\sigma$ control limits is considered:

- A. In statistical control, no action needed
- B. Out of statistical control, requiring investigation of the special cause
- C. Operating at Six Sigma quality
- D. Perfectly efficient

Answer: B

Points outside the 3-sigma control limits signal a special-cause variation that should be investigated and corrected.

Q14. The "Check" stage of the PDCA cycle primarily involves:

- A. Implementing the change on a full, permanent scale immediately
- B. Measuring and evaluating the results of the trial/pilot implementation against the target
- C. Ignoring results and moving to the next unrelated project
- D. Only documenting the original plan, without measurement

Answer: B

The Check phase compares actual results from the "Do" phase against the planned target to assess whether the change achieved its intended effect.

Q15. According to Altman's Z-Score model (1968), which of the following is NOT one of the five component ratios (X1-X5)?

- A. Working Capital/Total Assets
- B. Retained Earnings/Total Assets
- C. Sales/Total Assets
- D. Current Ratio

Answer: D

The Current Ratio is not one of Altman's five Z-Score components — the model uses Working Capital/TA, Retained Earnings/TA, EBIT/TA, Market Value of Equity/Total Liabilities, and Sales/TA (covered in detail in Module 4).

Economic Efficiency of the Firm — Performance Analysis

Profit optimisation under different market structures, price elasticity of demand, economies of scale, and X-efficiency concepts applied to firm-level performance analysis.

1. Formulas

Profit Maximisation Rule

Profit is maximised at the output where: Marginal Revenue (MR) = Marginal Cost (MC)

Applies across all market structures (perfect competition, monopoly, monopolistic competition, oligopoly) — what differs between structures is how MR relates to price.

Price Elasticity of Demand (PED)

$PED = (\% \text{ Change in Quantity Demanded}) / (\% \text{ Change in Price})$

$|PED| > 1$ = elastic demand (revenue rises when price falls); $|PED| < 1$ = inelastic demand (revenue falls when price falls); $|PED| = 1$ = unit elastic.

Perfect Competition — Firm's Demand & MR

Price = MR = AR (firm is a "price taker" facing a perfectly horizontal/elastic demand curve)

Long-run equilibrium: $P = MR = MC = \text{Minimum AC}$ (zero economic/supernormal profit due to free entry/exit).

Monopoly — Price vs Marginal Revenue

Price > MR = MC at the profit-maximising output (since a monopolist faces the entire downward-sloping market demand curve)

A monopolist can earn supernormal profit even in the long run due to barriers to entry — output is lower and price higher than under perfect competition.

Economies of Scale — Long-Run Average Cost

Economies of Scale exist when Long-Run Average Cost (LRAC) falls as output increases; Diseconomies of Scale when LRAC rises

Minimum Efficient Scale (MES) = the smallest output level at which LRAC reaches its minimum point.

X-Efficiency

X-Inefficiency = Actual Cost of Production – Theoretically Minimum (Technically Efficient) Cost, for a given output

Captures inefficiency arising from organisational slack/poor management (not from wrong scale or wrong input mix) — often more significant than allocative inefficiency in monopolistic/protected firms.

2. Practical Application

Elasticity & pricing decisions: A firm facing elastic demand should generally avoid price increases (total revenue would fall); a firm facing inelastic demand can raise price to increase total revenue, at least until close substitutes emerge.

Market structure and long-run performance: A firm's ability to sustain supernormal profits depends heavily on barriers to entry — perfectly competitive/monopolistically competitive firms see profits competed away over time, while monopolies/oligopolies with strong barriers can sustain higher long-run returns.

X-efficiency vs allocative efficiency: A firm can be "allocatively efficient" (producing where $P=MC$) yet still be X-inefficient (wasting resources through poor management) — performance improvement programs (Lean, Six Sigma) primarily target X-inefficiency.

3. Worked Illustration

Illustration 3.1 — Price Elasticity & Revenue Impact

A firm reduces its price from ₹100 to ₹90 (a 10% decrease), and quantity demanded rises from 1,000 to 1,300 units (a 30% increase).

How to Read This Problem: A price elasticity question giving an old and new price alongside old and new quantity — this is a two-step question: first find the elasticity coefficient, then use its magnitude to interpret and quantify the revenue impact.

Solution Approach: Calculate percentage changes in price and quantity first (using the values given, not assumed base points), divide to get elasticity, classify as elastic/inelastic based on whether $|PED|$ is above or below 1, then separately compute total revenue before and after to confirm your interpretation matches the actual numbers.

STEP-BY-STEP SOLUTION

Step 1 — Price Elasticity of Demand: $PED = 30\% / (-10\%) = -3.0$ (ignore sign; $|PED| = 3.0$)

Step 2 — Interpret: Since $|PED| = 3.0 > 1$, demand is highly ELASTIC.

Step 3 — Revenue impact: Old Revenue = $100 \times 1,000 = ₹1,00,000$. New Revenue = $90 \times 1,300 = ₹1,17,000$

Interpretation: Since demand is elastic, the 10% price cut led to a proportionally larger 30% rise in quantity sold, increasing total revenue from ₹1,00,000 to ₹1,17,000 — confirming that a price reduction is a good strategy when facing elastic demand.

4. Practice MCQs (15 × 2 Marks)

Q1. Under any market structure, profit is maximised at the output level where:

- A. Total Revenue is maximum, regardless of cost
- B. Marginal Revenue equals Marginal Cost
- C. Average Cost is minimum, regardless of revenue
- D. Price equals Average Fixed Cost

Answer: B

MR=MC is the universal profit-maximisation rule applicable across all market structures.

Q2. In perfect competition, an individual firm's demand curve is:

- A. Downward sloping and steep
- B. Perfectly horizontal (perfectly elastic) at the market price
- C. Vertical (perfectly inelastic)
- D. Upward sloping

Answer: B

A perfectly competitive firm is a "price taker" facing a horizontal demand curve at the prevailing market price — it can sell any quantity at that price.

Q3. A monopolist's price is:

- A. Equal to marginal revenue
- B. Greater than marginal revenue at the profit-maximising output
- C. Always equal to marginal cost
- D. Irrelevant to output decisions

Answer: B

Since a monopolist faces the downward-sloping market demand curve, price exceeds marginal revenue at every output level (except the first unit).

Q4. If $|PED| < 1$, demand is described as:

- A. Perfectly elastic
- B. Unit elastic
- C. Inelastic
- D. Elastic

Answer: C

An elasticity coefficient less than 1 in absolute value indicates inelastic demand — quantity responds proportionally less than price.

Q5. If demand is inelastic, a firm seeking to increase total revenue should generally:

- A. Decrease price
- B. Increase price
- C. Keep price and output unchanged always
- D. Give the product away for free

Answer: B

With inelastic demand, a price increase leads to a proportionally smaller decline in quantity, raising total revenue overall.

Q6. Economies of Scale exist when:

- A. Long-Run Average Cost rises as output increases
- B. Long-Run Average Cost falls as output increases
- C. Long-Run Average Cost remains constant regardless of output
- D. Marginal Cost equals zero at all output levels

Answer: B

Economies of scale are present when producing more units reduces the average cost per unit in the long run.

Q7. X-Inefficiency in a firm primarily arises from:

- A. Producing at the wrong scale of operation
- B. Organisational slack and poor management, causing actual costs to exceed the minimum achievable cost
- C. Perfect competition among firms
- D. Correct input mix decisions

Answer: B

X-inefficiency reflects a gap between actual and theoretically achievable minimum cost due to managerial/organisational shortcomings, distinct from scale or allocation issues.

Q8. In the long run, firms in a perfectly competitive market earn:

- A. Persistently high supernormal profits
- B. Zero economic (supernormal) profit, due to free entry and exit
- C. Guaranteed losses
- D. Profits set by government regulation only

Answer: B

Free entry/exit in perfect competition drives long-run economic profit to zero, as new entrants compete away any supernormal profits.

Q9. Minimum Efficient Scale (MES) refers to:

- A. The smallest possible firm size in an industry
- B. The output level at which Long-Run Average Cost first reaches its minimum
- C. The maximum output a firm can ever produce
- D. A fixed government-mandated production quota

Answer: B

MES is the smallest scale of output at which a firm exhausts available economies of scale, reaching the lowest point on its LRAC curve.

Q10. A monopoly is more likely than a perfectly competitive industry to exhibit:

- A. Lower price and higher output
- B. Higher price and lower output, along with the potential for sustained supernormal profit

- C. Identical price and output as perfect competition
- D. Zero long-run profit, just like perfect competition

Answer: B

Monopolies restrict output and charge higher prices than would prevail under perfect competition, often sustaining profits due to entry barriers.

Q11. Allocative efficiency is achieved when a firm produces at the output where:

- A. Price equals Marginal Cost
- B. Total Revenue is at its absolute maximum regardless of cost
- C. Fixed Costs are zero
- D. Average Cost equals zero

Answer: A

Allocative efficiency (from society's viewpoint) occurs where price equals marginal cost, reflecting resources being allocated to their most valued use.

Q12. A firm can be allocatively efficient ($P=MC$) yet still be:

- A. Perfectly efficient in every respect, with no possible improvement
- B. X-inefficient, due to internal organisational/managerial waste
- C. Making zero sales
- D. Operating with negative marginal cost

Answer: B

Allocative efficiency (correct pricing relative to marginal cost) is separate from X-efficiency (minimising actual cost through good management) — a firm can satisfy one without the other.

Q13. If a 5% price increase leads to only a 2% decrease in quantity demanded, the demand is:

- A. Elastic
- B. Inelastic
- C. Unit elastic
- D. Perfectly elastic

Answer: B

$|PED| = 2\%/5\% = 0.4$, which is less than 1, indicating inelastic demand.

Q14. Diseconomies of scale occur when:

- A. Average cost falls continuously with output
- B. Average cost rises as output increases beyond a certain point, often due to coordination/management difficulties in very large organisations
- C. Marginal cost is always zero
- D. Output has no effect on cost at any level

Answer: B

Beyond a certain scale, growing organisational complexity and coordination challenges can raise average costs — diseconomies of scale.

Q15. Monopolistic competition is characterised by:

- A. A single seller with no substitutes
- B. Many sellers offering differentiated products, with some pricing power but relatively free entry/exit
- C. Only two large firms dominating the market
- D. Perfectly homogeneous products with zero pricing power

Answer: B

Monopolistic competition features many firms with differentiated (not identical) products, giving each some pricing power, but with relatively easy entry limiting long-run supernormal profit.

Enterprise Risk Management

Identifying and measuring enterprise-wide risk, including corporate failure prediction using Altman's Z-Score model and an introduction to Value at Risk (VaR).

1. Formulas

Altman's Z-Score Model (1968) — Manufacturing/Public Firms

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$$

X_1 = Working Capital/Total Assets; X_2 = Retained Earnings/Total Assets; X_3 = EBIT/Total Assets; X_4 = Market Value of Equity/Total Liabilities (Book Value); X_5 = Sales/Total Assets.

Z-Score Interpretation Zones

$Z > 2.99$: "Safe Zone" (low bankruptcy risk)

$1.81 \leq Z \leq 2.99$: "Grey Zone" (caution)

$Z < 1.81$: "Distress Zone" (high bankruptcy risk)

Originally developed to predict corporate bankruptcy up to 2 years in advance with reasonable accuracy.

Value at Risk (VaR) — Concept

VaR = Estimate of the maximum potential loss on a portfolio/position, over a specified time horizon, at a given confidence level

E.g., "1-day 95% VaR of ₹10 lakh" means there is only a 5% chance of losing more than ₹10 lakh in one day, under normal market conditions.

Risk-Adjusted Return on Capital (RAROC)

$$\text{RAROC} = \frac{\text{Risk-Adjusted Return (Income - Expected Loss)}}{\text{Economic Capital (Capital at Risk)}}$$

Used in enterprise risk management to compare returns across business units on a risk-equivalent basis, not just raw return.

2. Practical Application

Z-Score as an early warning: Lenders, auditors, and credit rating agencies use the Z-Score as a quick screening tool to flag firms in financial distress, well before an actual default or bankruptcy filing occurs.

Limitations of Z-Score: Originally calibrated on US manufacturing firms — separate versions (Z' , Z'') exist for private firms and non-manufacturing/service/emerging-market firms; applying the original model outside its intended context can be misleading.

Enterprise Risk Management (ERM) framework: A holistic approach covering strategic, operational, financial, and compliance risks across the whole enterprise (not siloed by department) — typically involves risk identification, assessment, response, and continuous monitoring.

3. Worked Illustration

Illustration 4.1 — Altman's Z-Score Calculation

Total Assets = ₹10,00,000; Retained Earnings = ₹4,00,000; Sales = ₹12,00,000; Working Capital = ₹10,00,000 (this appears unusually high relative to Total Assets in the original exam question — used here exactly as given); EBIT = ₹1,50,000; Market Value of Equity = ₹8,00,000; Total Liabilities = ₹5,00,000.

How to Read This Problem: An Altman Z-Score question giving five separate balance sheet/income statement figures — since there are five ratios and five different weights, careful labelling of X1 through X5 as you compute each is essential to avoid mixing up which weight applies to which ratio.

Solution Approach: Compute each of the five component ratios (X1 to X5) one at a time, writing down which balance-sheet or income-statement line went into each. Only after all five are computed should you apply the respective weights (1.2, 1.4, 3.3, 0.6, 1.0) and sum — trying to combine calculation and weighting in one step is where most errors creep in.

STEP-BY-STEP SOLUTION

Step 1 — Compute each ratio:

$$X1 = WC/TA = 10,00,000/10,00,000 = 1.0$$

$$X2 = RE/TA = 4,00,000/10,00,000 = 0.4$$

$$X3 = EBIT/TA = 1,50,000/10,00,000 = 0.15$$

$$X4 = MVE/TL = 8,00,000/5,00,000 = 1.6$$

$$X5 = Sales/TA = 12,00,000/10,00,000 = 1.2$$

Step 2 — Apply the Z-Score formula: $Z = 1.2(1.0) + 1.4(0.4) + 3.3(0.15) + 0.6(1.6) + 1.0(1.2)$
 $= 1.2 + 0.56 + 0.495 + 0.96 + 1.2 = 4.415$

Step 3 — Interpret the zone: Since $Z (4.415) > 2.99$, the firm falls in the "Safe Zone"

Interpretation: With a Z-Score of 4.415 (well above the 2.99 threshold), Altman's model classifies this firm as financially healthy with a low probability of bankruptcy in the near term.

4. Practice MCQs (15 × 2 Marks)

Q1. According to Altman's Z-Score model, X5 is defined as:

- A. Working Capital/Total Assets
- B. Retained Earnings/Total Assets
- C. Sales/Total Assets
- D. Market Value of Equity/Total Liabilities

Answer: C

X5 = Sales/Total Assets, the asset turnover component of the Z-Score model.

Q2. If Total Assets = ₹10,00,000, Retained Earnings = ₹4,00,000, Sales = ₹12,00,000, Working Capital = ₹10,00,000, the value of X5 is:

- A. 0.4
- B. 0.83
- C. 1.0
- D. 1.2

Answer: D

X5 = Sales/Total Assets = $12,00,000/10,00,000 = 1.2$.

Q3. A Z-Score above 2.99 places a firm in the:

- A. Distress Zone
- B. Grey Zone
- C. Safe Zone
- D. Bankruptcy Zone

Answer: C

$Z > 2.99$ indicates the "Safe Zone," suggesting a low probability of bankruptcy according to Altman's original model.

Q4. A Z-Score below 1.81 indicates:

- A. The firm is in excellent financial health
- B. The firm is in the "Distress Zone," with high bankruptcy risk
- C. The firm has zero total liabilities
- D. No meaningful interpretation is possible

Answer: B

A Z-Score below 1.81 falls in Altman's "Distress Zone," signalling elevated bankruptcy risk.

Q5. Value at Risk (VaR) is best described as:

- A. The guaranteed loss a portfolio will experience
- B. An estimate of the maximum potential loss over a specified period at a given confidence level
- C. The total value of a portfolio
- D. A measure of a firm's profit margin

Answer: B

VaR quantifies the worst expected loss (at a stated confidence level) over a defined time horizon under normal market conditions.

Q6. X4 in Altman's Z-Score model uses:

- A. Book Value of Equity / Total Assets
- B. Market Value of Equity / Book Value of Total Liabilities
- C. Net Income / Sales
- D. Working Capital / Sales

Answer: B

X4 = Market Value of Equity/Total Liabilities (book value) — reflects the market's assessment of the firm's solvency cushion.

Q7. Altman's original 1968 Z-Score model was calibrated primarily on:

- A. Private, non-manufacturing service firms globally
- B. Publicly traded US manufacturing firms
- C. Government entities only
- D. Small unregistered sole proprietorships

Answer: B

The original model was developed using data from publicly traded US manufacturing companies — separate variants exist for other firm types.

Q8. Enterprise Risk Management (ERM) differs from traditional, siloed risk management because ERM:

- A. Focuses only on financial risk in the finance department
- B. Takes a holistic, enterprise-wide view across strategic, operational, financial, and compliance risks
- C. Ignores operational risks entirely
- D. Is applied only to publicly listed companies

Answer: B

ERM integrates risk management across the whole organisation rather than treating each risk type in isolation by department.

Q9. RAROC (Risk-Adjusted Return on Capital) is used primarily to:

- A. Compare business units' returns without considering the risk taken
- B. Compare returns across business units on a risk-equivalent basis
- C. Calculate depreciation
- D. Determine dividend payout ratios

Answer: B

RAROC adjusts raw returns for the risk (economic capital) taken to earn them, enabling fairer comparison across units with different risk profiles.

Q10. A firm's Z-Score falling in the "Grey Zone" (1.81 to 2.99) suggests:

- A. Definite bankruptcy within one year
- B. Ambiguous financial health, warranting closer monitoring rather than a definitive conclusion
- C. Complete financial safety with no risk
- D. The firm has zero debt

Answer: B

The Grey Zone reflects genuine uncertainty in the model's prediction — such firms warrant closer scrutiny rather than a clear-cut safe/distress classification.

Q11. If a bank quotes a "1-day 99% VaR of ₹50 lakh," this means:

- A. The bank will definitely lose ₹50 lakh tomorrow
- B. There is only a 1% chance of losing more than ₹50 lakh in one day under normal conditions
- C. The bank's total capital is ₹50 lakh
- D. The bank has no risk at all

Answer: B

A 99% confidence VaR of ₹50 lakh means there is only a 1% probability that losses will exceed ₹50 lakh over the one-day horizon.

Q12. X2 in Altman's Z-Score model (Retained Earnings/Total Assets) primarily captures:

- A. The firm's short-term liquidity only
- B. The firm's cumulative profitability and age/maturity (older, consistently profitable firms tend to have higher retained earnings relative to assets)
- C. Current market sentiment only
- D. Tax liability

Answer: B

Retained Earnings/Total Assets reflects accumulated historical profitability, often correlating with firm age and financial stability.

Q13. A key limitation of using the original Altman Z-Score model for a private (non-listed) company is:

- A. Private companies have no total assets
- B. X4 requires Market Value of Equity, which is not directly observable for unlisted firms — a modified version (Z') is used instead
- C. The model cannot be applied to any company type
- D. Private companies have no retained earnings by definition

Answer: B

Since private firms lack a quoted market value of equity, a modified Z'-Score model substitutes book value of equity for market value in the X4 ratio.

Q14. Which of the following is a component of a robust Enterprise Risk Management framework?

- A. Risk identification, assessment, response, and ongoing monitoring
- B. Ignoring emerging risks until they cause a crisis
- C. Managing only insurable risks
- D. A one-time risk assessment with no follow-up

Answer: A

A sound ERM framework is a continuous, cyclical process — not a one-time exercise — covering identification through to ongoing monitoring and response.

Q15. X3 in the Z-Score model (EBIT/Total Assets) is essentially a measure of:

- A. The firm's leverage only
- B. Operating profitability/earning power of the firm's total assets, independent of tax and financing effects
- C. The firm's dividend policy
- D. Sales growth rate

Answer: B

EBIT/Total Assets isolates operating earning power before the effects of interest (financing) and taxes — a pure measure of asset productivity.

SECTION B

Business Valuation

Weightage: 50% of total marks | Modules 5–9

Fundamentals of Business Valuation

Core building blocks of valuation — Enterprise Value vs Equity Value, cost of capital (CAPM, WACC), and the time-value-of-money foundations underlying every valuation approach.

1. Formulas

Enterprise Value (EV)

$$EV = \text{Market Capitalisation} + \text{Total Debt} - \text{Cash \& Cash Equivalents}$$

EV represents the total value of the firm's core operations, independent of its capital structure — the value an acquirer would effectively pay to take over the whole business.

Equity Value (Market Capitalisation)

$$\text{Equity Value} = \text{Enterprise Value} - \text{Net Debt (Total Debt - Cash)}$$

Equity Value = Share Price × Number of Shares Outstanding, for a listed company.

Cost of Equity — CAPM

$$K_e = R_f + \beta(R_m - R_f)$$

The most widely used method to estimate the discount rate for equity cash flows in valuation (see Module 6 formulas in the SFM book for full derivation).

Weighted Average Cost of Capital (WACC)

$$WACC = (E/V) \times K_e + (D/V) \times K_d(1-t)$$

E=Market Value of Equity, D=Market Value of Debt, V=E+D, K_d=pre-tax cost of debt, t=tax rate. WACC is the standard discount rate for firm-level (Enterprise Value) DCF valuation.

Gordon Growth (Perpetuity) Valuation

$$\text{Value} = \text{Cash Flow(next period)} / (\text{Discount Rate} - \text{Growth Rate})$$

The foundational "terminal value" formula used across almost every income-approach valuation method (see Module 7).

2. Practical Application

EV vs Equity Value — when to use which: Use Enterprise Value when comparing companies with different capital structures (it strips out financing choices); use Equity Value when the question is specifically about what shareholders own/receive.

Choosing the discount rate: Discount Free Cash Flow to Firm (FCFF) at WACC to get Enterprise Value; discount Free Cash Flow to Equity (FCFE) at Cost of Equity (K_e) to get Equity Value directly — mixing these up is one of the most common valuation exam errors.

Why valuation is inherently an estimate: Every valuation depends on assumptions (growth rate, discount rate, terminal value) — exam answers should show sensitivity/scenario thinking, not present a single number as definitively "correct."

3. Worked Illustration

Illustration 5.1 — Enterprise Value & WACC

A company has: Market Cap = ₹80,00,00,000; Total Debt = ₹30,00,00,000; Cash = ₹5,00,00,000. Cost of Equity = 15%, Pre-tax Cost of Debt = 10%, Tax Rate = 25%. Market values: Equity = ₹80 crore, Debt = ₹30 crore.

How to Read This Problem: An Enterprise Value / WACC question giving market cap, debt, cash, and separate costs of equity and debt — this is really two calculations bundled together: a simple EV computation, followed by a full weighted-average cost of capital build-up.

Solution Approach: Compute Enterprise Value first (it's independent of the WACC calculation). Separately, find the capital structure WEIGHTS using market values of equity and debt, apply the tax shield to the cost of debt, and combine using the weights — keep EV and WACC as two clearly separate answer blocks even though they use overlapping inputs.

STEP-BY-STEP SOLUTION

Step 1 — Enterprise Value: $EV = 80,00,00,000 + 30,00,00,000 - 5,00,00,000 = ₹1,05,00,00,000$ (₹105 crore)

Step 2 — Capital structure weights: $V = E + D = 80 + 30 = 110$ crore. $E/V = 80/110 = 0.727$; $D/V = 30/110 = 0.273$

Step 3 — After-tax cost of debt: $K_d(1-t) = 10\% \times (1-0.25) = 7.5\%$

Step 4 — WACC: $WACC = (0.727 \times 15\%) + (0.273 \times 7.5\%) = 10.90\% + 2.05\% = 12.95\%$

Interpretation: Enterprise Value = ₹105 crore; WACC = 12.95% — this WACC would be used to discount the firm's Free Cash Flow to Firm (FCFF) projections in an income-approach (DCF) valuation.

4. Practice MCQs (15 × 2 Marks)

Q1. Enterprise Value is calculated as:

- A. Market Capitalisation only
- B. Market Capitalisation + Total Debt – Cash & Cash Equivalents
- C. Total Assets – Total Liabilities
- D. Net Income × P/E Ratio

Answer: B

EV captures the value of the total business (both debt and equity claims), net of cash which could be used to pay down debt.

Q2. Free Cash Flow to Firm (FCFF) should be discounted at:

- A. Cost of Equity
- B. WACC
- C. Risk-free rate only
- D. Pre-tax cost of debt only

Answer: B

FCFF represents cash flow available to ALL capital providers (debt+equity), so it must be discounted at the blended WACC to arrive at Enterprise Value.

Q3. Free Cash Flow to Equity (FCFE) should be discounted at:

- A. WACC
- B. Cost of Equity (K_e)
- C. Pre-tax Cost of Debt
- D. The company's average tax rate

Answer: B

FCFE represents cash flow left specifically for equity holders after debt obligations, so it's discounted at the cost of equity to directly yield Equity Value.

Q4. In the WACC formula, K_d is adjusted by $(1-t)$ because:

- A. Interest on debt is tax-deductible, creating a tax shield that reduces the effective cost of debt
- B. Dividends are tax-deductible
- C. Debt has no cost at all
- D. Taxes increase the cost of debt

Answer: A

Since interest expense reduces taxable income, the effective (after-tax) cost of debt is lower than the stated (pre-tax) rate by the factor $(1-t)$.

Q5. Equity Value relates to Enterprise Value as:

- A. Equity Value = EV + Net Debt
- B. Equity Value = EV – Net Debt
- C. Equity Value = EV × Net Debt
- D. Equity Value has no relationship to EV

Answer: B

Subtracting net debt (Total Debt – Cash) from Enterprise Value isolates the value attributable specifically to equity holders.

Q6. If Market Cap = ₹50 crore, Total Debt = ₹20 crore, Cash = ₹8 crore, the Enterprise Value is:

- A. ₹38 crore
- B. ₹62 crore
- C. ₹70 crore
- D. ₹78 crore

Answer: B

EV = 50 + 20 – 8 = ₹62 crore.

Q7. Under CAPM, a higher Beta for a stock implies:

- A. Lower required return (K_e)
- B. Higher required return (K_e), reflecting higher systematic risk
- C. No impact on required return
- D. The stock is risk-free

Answer: B

Since $K_e = R_f + \beta(R_m - R_f)$, a higher beta directly increases the required return demanded by equity investors.

Q8. A common valuation error to avoid is:

- A. Discounting FCFF at WACC and FCFE at Cost of Equity, correctly matched
- B. Discounting FCFF at Cost of Equity (mismatching cash flow and discount rate)
- C. Using CAPM to estimate cost of equity
- D. Considering both debt and equity in WACC

Answer: B

Mismatching the cash flow measure with the wrong discount rate (e.g., FCFF at K_e instead of WACC) is a classic, mark-losing valuation error.

Q9. Market Value weights (not book value weights) are preferred in the WACC formula because they:

- A. Are always easier to obtain than book values
- B. Reflect the current opportunity cost investors face, better representing the true cost of capital
- C. Are required by tax law
- D. Never change over time

Answer: B

Market values reflect the actual current cost investors demand, making WACC more economically meaningful than using historical book values.

Q10. If a firm has no debt at all (100% equity-financed), its WACC equals:

- A. Zero
- B. Its Cost of Equity (K_e)
- C. Its Cost of Debt (K_d)
- D. The risk-free rate only

Answer: B

With $D/V=0$ and $E/V=1$, WACC simplifies to just K_e — the cost of equity is the sole component.

Q11. Valuation results are best understood as:

- A. Precise, objectively "correct" figures with no room for judgement
- B. Estimates that depend heavily on the underlying assumptions used (growth, discount rate, etc.)
- C. Always identical regardless of the method used
- D. Irrelevant to business decision-making

Answer: B

Since valuation relies on forward-looking assumptions, results are inherently estimates, sensitive to the inputs chosen — not a single "correct" number.

Q12. The Gordon Growth (perpetuity) formula for valuing a cash flow stream requires that:

- A. The growth rate exceeds the discount rate
- B. The discount rate exceeds the growth rate
- C. Growth rate and discount rate are always equal
- D. Cash flows are always negative

Answer: B

The perpetuity formula $\text{Value} = \text{CF} / (r - g)$ requires $r > g$; otherwise the formula gives a nonsensical (negative or infinite) result.

Q13. Net Debt is calculated as:

- A. Total Debt + Cash
- B. Total Debt – Cash & Cash Equivalents
- C. Total Debt × Interest Rate
- D. Total Assets – Total Debt

Answer: B

Net Debt = Total Debt minus Cash & Cash Equivalents, representing the debt burden net of readily available cash resources.

Q14. For a company being compared to peers with very different debt levels, analysts typically prefer to compare:

- A. Equity Value only
- B. Enterprise Value (and EV-based multiples like EV/EBITDA), since it neutralises capital structure differences
- C. Only the book value of assets
- D. Only the dividend per share

Answer: B

EV-based comparisons remove the distortion caused by differing debt/equity mixes across peer companies, enabling a fairer comparison.

Q15. In the CAPM formula, " $R_m - R_f$ " represents:

- A. The risk-free rate alone
- B. The equity/market risk premium
- C. The company's own historical return
- D. The tax rate

Answer: B

$R_m - R_f$ is the market (equity) risk premium — the extra return investors demand for bearing overall market risk over the risk-free rate.

Laws & Compliance in Business Valuation

Largely conceptual — the legal and regulatory framework governing valuation in India: Companies Act provisions, SEBI regulations, the Insolvency and Bankruptcy Code (IBC), and the Registered Valuers framework.

1. Key Conceptual Areas & Applicable Framework

Law/Regulation	Relevance to Valuation
Companies Act, 2013 (esp. Section 247)	Mandates valuation by a "Registered Valuer" for specified transactions (e.g., issue of shares for non-cash consideration, mergers, buy-backs).
Companies (Registered Valuers and Valuation) Rules, 2017	Governs the registration, eligibility, and conduct of Registered Valuers (individuals/partnership firms/companies) under IBBI oversight.
Insolvency and Bankruptcy Code (IBC), 2016	Requires valuation of assets during Corporate Insolvency Resolution Process (CIRP) and liquidation — typically two Registered Valuers are appointed for cross-verification.
SEBI (ICDR) Regulations	Governs valuation/pricing requirements for preferential allotments, IPOs, and other capital market issuances by listed companies.
SEBI (SAST) Regulations, 2011	Prescribes valuation methodology for determining the offer price in open offers triggered by substantial acquisition of shares/takeovers.
Income Tax Act, 1961 (Rule 11UA)	Prescribes specific valuation methods (e.g., NAV method, DCF method) for tax purposes such as angel tax (Section 56(2)(viib)) on share premium.
FEMA Regulations	Requires fair valuation (e.g., DCF method historically, now any internationally accepted method) for cross-border share transfers/issuances involving non-residents.

2. Practical Application

Who can value what: Under the Companies Act framework, only a Registered Valuer (registered with IBBI) can conduct valuations for specified statutory purposes — using an unregistered/unqualified valuer for these transactions can invalidate the process.

Why regulatory context matters in exams: The SAME company might need different valuation methodologies/approaches depending on the PURPOSE (e.g., IBC liquidation vs SEBI open offer vs tax computation) — exam questions often test whether the candidate applies the RIGHT regulatory valuation approach for the stated context, not just any method.

Two-valuer requirement under IBC: During CIRP, the Resolution Professional typically appoints two Registered Valuers to independently value the corporate debtor's assets — the average (or a specified rule) of the two valuations is often used, reducing single-valuer bias risk.

3. Illustrative Scenario

Illustration 6.1 — Identifying the Applicable Regulatory Framework

A listed company plans to make a preferential allotment of shares to a group of investors. Separately, an unlisted startup is issuing shares to a foreign venture capital investor. Identify the primary regulatory frameworks governing valuation in each case.

How to Read This Problem: A regulatory-context question describing two different transaction scenarios rather than giving numbers — this tests your ability to match the RIGHT valuation law/framework to the FACTS of each scenario, which is just as exam-critical as numerical fluency in this subject.

Solution Approach: For each scenario, ask three questions in order: Is the company listed or unlisted? Is a non-resident party involved? What is the PURPOSE of the valuation (M&A, tax, takeover, cross-border)? The answers to these three questions point you directly to the applicable law.

STEP-BY-STEP SOLUTION

Case 1 — Listed company preferential allotment: Governed primarily by SEBI (ICDR) Regulations, which prescribe a specific pricing formula/floor price based on historical trading prices for the preferential issue.

Case 2 — Unlisted startup issuing shares to a foreign investor: Governed primarily by FEMA regulations (pricing guidelines for cross-border share issuance to non-residents), typically requiring a fair valuation certificate from a Registered Valuer/Chartered Accountant/Merchant Banker using an internationally accepted valuation methodology.

Interpretation: Even though both cases involve "issuing shares and determining a value," the applicable law, prescribed methodology, and who can certify the valuation differ significantly based on whether the company is listed, and whether the investor is resident or non-resident.

4. Practice MCQs (15 × 2 Marks)

Q1. Under the Companies Act, 2013, valuations for specified transactions (e.g., non-cash share issues, mergers) must be conducted by:

- A. Any chartered accountant, regardless of registration
- B. A Registered Valuer registered under the applicable Rules
- C. The company's own internal finance team only
- D. Any individual chosen at the promoter's discretion

Answer: B

Section 247 of the Companies Act mandates valuation by a Registered Valuer for the specified categories of transactions.

Q2. During the Corporate Insolvency Resolution Process (CIRP) under the IBC, how many Registered Valuers are typically appointed?

- A. Zero — valuation is not required
- B. One
- C. Two, for independent cross-verification
- D. Five

Answer: C

The Resolution Professional typically appoints two independent Registered Valuers during CIRP to reduce single-valuer bias in asset valuation.

Q3. Rule 11UA under the Income Tax Act is primarily relevant to:

- A. GST return filing
- B. Prescribed valuation methods (e.g., NAV, DCF) for tax purposes such as angel tax on share premium
- C. Customs duty calculation
- D. TDS on salary

Answer: B

Rule 11UA prescribes specific valuation approaches used for income-tax provisions like Section 56(2)(viib), commonly referred to as "angel tax."

Q4. SEBI (SAST) Regulations, 2011 are primarily concerned with:

- A. GST compliance
- B. Determining the offer price in open offers triggered by substantial acquisition of shares/takeovers
- C. Employee provident fund contributions
- D. Customs valuation of imported goods

Answer: B

SAST (Substantial Acquisition of Shares and Takeovers) Regulations prescribe the pricing/valuation methodology for mandatory open offers in takeover situations.

Q5. FEMA regulations on valuation are most relevant when:

- A. Two resident Indian individuals transfer shares between themselves
- B. Shares are issued or transferred involving a non-resident party
- C. A company purchases office furniture
- D. A firm files its annual GST return

Answer: B

FEMA pricing guidelines specifically govern valuation for cross-border transactions involving non-resident investors.

Q6. A "Registered Valuer" under Indian law must be registered with:

- A. The Reserve Bank of India (RBI) only
- B. The Insolvency and Bankruptcy Board of India (IBBI)
- C. The Ministry of External Affairs
- D. Local municipal authorities

Answer: B

The Companies (Registered Valuers and Valuation) Rules, 2017 place Registered Valuers under the regulatory oversight of the IBBI.

Q7. A key exam-relevant point about valuation regulation is that:

- A. One single valuation method applies to every transaction, regardless of purpose
- B. The applicable law and prescribed method can differ significantly depending on the PURPOSE of the valuation (e.g., IBC, SEBI, tax, FEMA)
- C. Valuation laws are identical across all countries
- D. Only listed companies ever require any valuation

Answer: B

The same company might need entirely different valuation methodologies depending on WHY the valuation is being done — exams test this contextual understanding.

Q8. SEBI (ICDR) Regulations are most relevant to:

- A. Private unlisted partnership firms
- B. Pricing/valuation requirements for preferential allotments, IPOs, and other capital market issuances by listed entities
- C. Personal income tax computation
- D. Customs duty on imported machinery

Answer: B

ICDR (Issue of Capital and Disclosure Requirements) Regulations govern how listed companies price and value shares issued through various capital market routes.

Q9. Using an unregistered or unqualified valuer for a statutorily mandated valuation (e.g., under Companies Act Section 247) can result in:

- A. No consequence whatsoever
- B. Potential invalidation of the valuation/transaction and regulatory non-compliance
- C. Automatic approval by the regulator
- D. A tax refund

Answer: B

Statutory valuations require a properly Registered Valuer; using an unqualified person risks the valuation (and dependent transaction) being challenged or invalidated.

Q10. The Companies (Registered Valuers and Valuation) Rules, 2017 govern:

- A. GST registration procedures
- B. Eligibility, registration, and conduct requirements for Registered Valuers
- C. Customs clearance procedures
- D. Only foreign direct investment limits

Answer: B

These rules set out who can become a Registered Valuer, the registration process, and the professional/ethical conduct expected of them.

Q11. During liquidation proceedings under the IBC, asset valuation is important primarily because it:

- A. Has no bearing on the liquidation process

- B. Helps determine the realisable value of assets for fair distribution among creditors/stakeholders
- C. Is only relevant for tax purposes
- D. Determines employee salaries

Answer: B

Accurate asset valuation ensures liquidation proceeds are realistically estimated and fairly distributed according to the statutory waterfall of claims.

Q12. In an open offer triggered by a substantial acquisition of shares, the offer price is influenced by valuation rules under:

- A. The Indian Contract Act
- B. SEBI (SAST) Regulations, 2011
- C. The Negotiable Instruments Act
- D. The Consumer Protection Act

Answer: B

SAST Regulations prescribe the minimum offer price calculation methodology for mandatory open offers in takeover scenarios.

Q13. "Angel Tax" provisions under the Income Tax Act relate to:

- A. Tax on angel investors' personal income only
- B. Taxing the excess of share issue price over "fair market value" (as determined under Rule 11UA) as income for certain closely-held companies
- C. A tax exclusively on foreign investors
- D. GST on angel investment services

Answer: B

Section 56(2)(viib), commonly called "angel tax," taxes share premium received in excess of fair market value (computed per prescribed rules) as income in the hands of certain companies.

Q14. Cross-border share pricing guidelines under FEMA typically require valuation certification from:

- A. Any unregistered individual
- B. A Registered Valuer, Chartered Accountant, or Merchant Banker, using an internationally accepted valuation methodology
- C. A local municipal officer
- D. No certification is ever required

Answer: B

FEMA pricing guidelines generally require a fair valuation certificate from an appropriately qualified professional (Registered Valuer/CA/Merchant Banker).

Q15. Understanding the legal/regulatory context of valuation is important for a CMA primarily because:

- A. Valuation numbers are identical regardless of purpose or regulation
- B. Choosing the wrong methodology or an unqualified valuer for a specific statutory purpose can have serious legal and financial consequences
- C. Regulations never change and require no ongoing awareness
- D. Only lawyers, never finance professionals, need this knowledge

Answer: B

A finance professional advising on or conducting valuations must align the methodology, and the valuer's qualification, with the specific statutory purpose to avoid legal/compliance risk.

Business Valuation Methods & Approaches

The three core valuation approaches — Asset-based, Income-based (DCF/FCFF/FCFE), and Market-based (comparable company/transaction multiples).

1. Formulas

A. Asset-Based Approach

Net Asset Value (NAV) Method

$$\text{NAV} = \text{Fair Value of Total Assets} - \text{Fair Value of Total Liabilities}$$

Best suited for asset-heavy businesses (real estate, holding companies) or as a "floor value" check — less suitable for firms whose value lies mainly in future earning potential/intangibles.

B. Income Approach — Discounted Cash Flow (DCF)

Free Cash Flow to Firm (FCFF)

$$\text{FCFF} = \text{EBIT}(1-t) + \text{Depreciation \& Amortisation} - \text{Capital Expenditure} - \text{Increase in Net Working Capital}$$

Represents cash available to ALL capital providers (debt + equity) before financing costs — discounted at WACC to get Enterprise Value.

Free Cash Flow to Equity (FCFE)

$$\text{FCFE} = \text{FCFF} - \text{Interest}(1-t) + \text{Net Borrowing (New Debt - Debt Repaid)}$$

[Alternative direct route]: $\text{FCFE} = \text{Net Income} + \text{Depreciation} - \text{Capex} - \Delta \text{Working Capital} + \text{Net Borrowing}$. Discounted at Cost of Equity to get Equity Value directly.

DCF Valuation — Enterprise Value

$$\text{EV} = \sum [\text{FCFF}_t / (1+\text{WACC})^t] + [\text{Terminal Value} / (1+\text{WACC})^n]$$

Terminal Value (Gordon Growth) = $\text{FCFF}_{(n+1)} / (\text{WACC} - g)$, where g = long-run stable growth rate (typically $\leq$ long-run GDP/inflation growth).

C. Market Approach — Relative Valuation

Comparable Company Multiple — EV/EBITDA

$$\text{Estimated EV} = \text{Target's EBITDA} \times \text{Peer Average EV/EBITDA Multiple}$$

EV/EBITDA is capital-structure neutral (uses EV, and EBITDA is before interest) — a very commonly used multiple for cross-company comparison.

Comparable Company Multiple — P/E

$$\text{Estimated Equity Value per Share} = \text{Target's EPS} \times \text{Peer Average P/E Multiple}$$

Simple and widely used, but distorted by differing capital structures, accounting policies, and one-off items across peers.

Precedent Transaction Multiple

$$\text{Estimated Value} = \text{Target's Metric (EBITDA/Sales)} \times \text{Multiple paid in comparable PAST M\&A transactions}$$

Includes a "control premium" (since past deals typically involved acquiring a controlling stake) — typically yields a higher value than trading (public market) comparables.

2. Practical Application

Choosing the right approach: Asset approach suits asset-heavy/liquidation scenarios; Income approach (DCF) suits going-concern businesses with predictable future cash flows; Market approach is quick and market-validated but requires genuinely comparable peers to be meaningful.

Triangulation: Best practice (and common in exam answers) is to value a business using 2-3 approaches and present a range, rather than relying on a single method — this also demonstrates awareness that no single method is definitively "correct."

Terminal value dominance in DCF: Terminal value often constitutes 60-80% of total DCF value for a growing business — meaning the DCF valuation is extremely sensitive to the assumed long-term growth rate and discount rate used in the terminal value calculation.

3. Worked Illustration

Illustration 7.1 — Simplified DCF (Enterprise Value)

Projected FCFF: Year 1 = ₹50 lakh, Year 2 = ₹60 lakh, Year 3 = ₹70 lakh. From Year 4 onward, FCFF grows at a stable 5% p.a. forever. WACC = 12%.

How to Read This Problem: A DCF Enterprise Value question giving an explicit forecast period of cash flows plus a stable growth rate for the years beyond — recognise immediately that this needs TWO separate present value calculations (explicit period + terminal value) added together, not one continuous stream.

Solution Approach: Discount each explicit-period cash flow to present value and sum them first. Separately, grow the LAST explicit year's cash flow one more year at the stable rate to get the terminal year's cash flow, apply the Gordon Growth formula to get Terminal Value AT THE END of the explicit period, then discount that lump sum back to today using the same number of periods as the explicit forecast — a very common error is discounting the terminal value by one period too many or too few.

STEP-BY-STEP SOLUTION

Step 1 — PV of explicit forecast period (Years 1-3):

$$PV(Y1) = 50/1.12 = 44.64$$

$$PV(Y2) = 60/1.12^2 = 47.83$$

$$PV(Y3) = 70/1.12^3 = 49.83$$

$$\text{Sum} = \text{₹}142.30 \text{ lakh}$$

Step 2 — Terminal Value (at end of Year 3):

$$FCFF(\text{Year } 4) = 70 \times 1.05 = 73.5. \text{ TV} = 73.5/(0.12-0.05) = 73.5/0.07 = \text{₹}1,050 \text{ lakh}$$

Step 3 — PV of Terminal Value:

$$1,050 / (1.12)^3 = 1,050/1.4049 = \text{₹}747.4 \text{ lakh}$$

Step 4 — Enterprise Value:

$$EV = 142.30 + 747.4 = \text{₹}889.7 \text{ lakh (≈₹8.90 crore)}$$

Interpretation: Enterprise Value ≈ ₹8.90 crore. Note that the Terminal Value component (₹747.4 lakh, PV) makes up over 84% of the total valuation — illustrating how sensitive DCF outcomes are to the terminal growth and discount rate assumptions.

4. Practice MCQs (15 × 2 Marks)

Q1. The Asset-Based Approach to valuation is most appropriate for:

- A. A high-growth technology start-up with no tangible assets
- B. An asset-heavy business such as real estate or a holding company
- C. A pure service business with only intangible value
- D. Any business, regardless of its asset base

Answer: B

Asset-based valuation works best where the firm's value is closely tied to its tangible asset base, such as real estate or holding companies.

Q2. FCFF, unlike FCFE, represents cash flow available to:

- A. Only equity shareholders
- B. All capital providers — both debt and equity holders
- C. Only debt holders
- D. Only the government (as tax)

Answer: B

FCFF is calculated before any financing charges, representing cash available to service both debt and equity claims.

Q3. In DCF valuation, Terminal Value is typically calculated using:

- A. The Payback Period formula
- B. The Gordon Growth (perpetuity) formula, based on a stable long-term growth rate
- C. The Hungarian method
- D. Altman's Z-Score formula

Answer: B

Terminal Value = $FCF(n+1)/(r-g)$, applying the perpetuity growth model beyond the explicit forecast period.

Q4. EV/EBITDA is generally preferred over the P/E multiple for cross-company comparison because EV/EBITDA is:

- A. Distorted by differing capital structures
- B. Capital-structure neutral, since it uses Enterprise Value and pre-interest earnings
- C. Only usable for loss-making companies
- D. Identical to the P/E ratio in every case

Answer: B

Since EV includes both debt and equity, and EBITDA is before interest expense, this multiple neutralises differences in how peer companies are financed.

Q5. Precedent Transaction multiples typically yield a HIGHER valuation than trading (public market) comparables mainly because they include:

- A. A liquidity discount
- B. A control premium paid to acquire a controlling stake
- C. No premium of any kind
- D. Only minority stake pricing

Answer: B

Since past M&A deals usually involved acquiring control, the multiples paid reflect a control premium not present in ordinary public market trading prices.

Q6. If FCFF = ₹100 lakh, Interest Expense = ₹20 lakh, Tax Rate = 25%, and Net Borrowing = ₹10 lakh, FCFE is:

- A. ₹75 lakh
- B. ₹85 lakh
- C. ₹95 lakh
- D. ₹110 lakh

Answer: C

$FCFE = FCFF - \text{Interest}(1-t) + \text{Net Borrowing} = 100 - 20(0.75) + 10 = 100 - 15 + 10 = ₹95 \text{ lakh.}$

Q7. Terminal Value in a DCF valuation typically represents what proportion of the total valuation for a growing business?

- A. Less than 5%
- B. 10-20%
- C. 60-80% or even higher
- D. Exactly 50%, always

Answer: C

Terminal Value commonly dominates total DCF value (often 60-80%+), making the valuation highly sensitive to the terminal growth and discount rate assumptions.

Q8. Best practice in business valuation generally recommends:

- A. Relying on a single valuation method exclusively
- B. Using multiple approaches (asset, income, market) and presenting a value range or triangulated estimate
- C. Ignoring market data entirely

D. Using only the book value of assets

Answer: B

Triangulating across approaches provides a more robust, defensible valuation than relying on any single method alone.

Q9. The Market Approach to valuation relies primarily on:

- A. Discounting future cash flows
- B. Comparing the target to similar publicly traded companies or comparable past transactions
- C. Summing the fair value of individual assets and liabilities
- D. Estimating replacement cost of assets only

Answer: B

The market approach derives value by reference to how the market prices similar/comparable businesses (trading comps or precedent transactions).

Q10. A limitation of the Market Approach is that it:

- A. Never requires any comparable companies
- B. Is only meaningful if genuinely comparable peer companies/transactions can be identified
- C. Cannot use publicly available data
- D. Always gives the same value as the income approach

Answer: B

The market approach's reliability depends heavily on finding truly comparable peers — a lack of good comparables weakens the method significantly.

Q11. Net Asset Value (NAV) method is generally considered a "floor value" because it:

- A. Represents the highest possible value a business could achieve
- B. Typically ignores the value of future growth/earning potential, often understating a going-concern's true value
- C. Always exceeds the income-approach valuation
- D. Is irrelevant to any valuation exercise

Answer: B

Since NAV only captures existing assets net of liabilities (not future earning potential), it often provides a conservative lower-bound estimate for a healthy going concern.

Q12. In DCF valuation, capital expenditure (Capex) is:

- A. Added to $EBIT(1-t)$ when calculating FCFF
- B. Subtracted from $EBIT(1-t)$ when calculating FCFF, since it represents a real cash outflow
- C. Ignored entirely in FCFF calculations
- D. Only relevant for tax computation, not valuation

Answer: B

Capex is a genuine cash outflow reducing free cash flow available to investors, so it is subtracted in the FCFF formula.

Q13. If two companies have identical EBITDA but very different debt levels, which multiple would make them MORE comparable?

- A. P/E ratio
- B. EV/EBITDA
- C. Dividend Yield
- D. Book Value per Share

Answer: B

EV/EBITDA neutralises the effect of differing debt levels since EV includes debt and EBITDA is calculated before interest expense.

Q14. A stable growth rate (g) assumed in Terminal Value calculations should typically be:

- A. Higher than the discount rate
- B. Realistic and sustainable in the long run — generally not exceeding long-run economic (GDP) growth
- C. As high as possible to maximise valuation
- D. Always negative

Answer: B

An unrealistically high perpetual growth rate (e.g., exceeding long-run GDP growth) would imply the company eventually becomes larger than the entire economy — a red flag in any DCF model.

Q15. Which valuation approach would be considered LEAST appropriate for a young start-up with negative earnings but high growth potential?

- A. Discounted Cash Flow (with appropriately adjusted assumptions for the growth stage)
- B. Net Asset Value / Asset-Based Approach, since it ignores future growth potential entirely
- C. Comparable company multiples using forward revenue multiples
- D. Venture capital method

Answer: B

NAV captures only existing net assets, completely missing the future growth potential that drives most of a start-up's actual value — making it the least suitable approach here.

Valuation of Assets & Liabilities

Valuing specific balance sheet items — goodwill, intangible assets (brands, patents), and value-based performance metrics like EVA and MVA used in valuation.

1. Formulas

A. Goodwill Valuation

Super Profit

$$\text{Super Profit} = \text{Average (Actual) Profit} - \text{Normal Profit}$$

Normal Profit = Normal Rate of Return × Capital Employed. Super profit represents the firm's ability to earn above what's "normal" for its industry/risk level.

Goodwill — Super Profit Method (Years' Purchase)

$$\text{Goodwill} = \text{Super Profit} \times \text{Number of Years' Purchase}$$

"Years' Purchase" reflects how many years of super profit a buyer is willing to pay for upfront — often based on industry norms/risk assessment.

Goodwill — Capitalisation Method

$$\text{Goodwill} = \text{Super Profit} / \text{Normal Rate of Return}$$

[Alternative]: Goodwill = (Average Profit / Normal Rate of Return) × Capital Employed — effectively capitalises the super profit into a lump-sum value.

Goodwill — Annuity Method

$$\text{Goodwill} = \text{Super Profit} \times \text{Present Value Annuity Factor (for the agreed number of years, at the given rate)}$$

Recognises the time value of money, unlike the simple Years' Purchase method which just multiplies without discounting.

B. Intangible Asset Valuation

Relief-from-Royalty Method (for Brands/Trademarks)

$$\text{Brand Value} = \text{PV of (Hypothetical Royalty Rate} \times \text{Projected Revenue), discounted over the brand's useful economic life}$$

Based on the premise: if the firm didn't own the brand, it would have to pay a royalty to license it — the value of the brand equals the PV of royalties "saved" by owning it.

Multi-Period Excess Earnings Method (MEEM)

$$\text{Value of Intangible} = \text{PV of (Total Cash Flows attributable to the asset} - \text{Contributory Asset Charges for other assets used alongside it)}$$

Used typically for customer relationships/technology — isolates the earnings specifically attributable to the intangible after "renting" the other assets that help generate those earnings.

C. Value-Based Performance Metrics

Economic Value Added (EVA)

$$\text{EVA} = \text{NOPAT} - (\text{Capital Employed} \times \text{WACC})$$

A positive, growing EVA over time is a strong indicator that a business is genuinely creating shareholder value, useful evidence supporting a higher valuation.

Market Value Added (MVA)

MVA = Market Value of the Firm (Debt+Equity) – Total Capital Invested (Book Value)

MVA represents the cumulative wealth the firm has created (or destroyed) for capital providers since inception, as reflected in current market value versus capital originally invested.

2. Practical Application

When Super Profit is negative: If actual profit is below normal profit, super profit (and hence goodwill under this method) is effectively zero or negative — practically, goodwill is not recognised as negative; it's simply treated as nil.

Choosing an intangible valuation method: Relief-from-royalty suits brands/trademarks (where a comparable royalty rate can be benchmarked); MEEM suits customer relationships/technology (where isolating asset-specific cash flow is more relevant than a royalty analogy).

EVA/MVA link to valuation: A company consistently generating positive EVA is "creating value" beyond its cost of capital — this evidence often supports valuing the firm at a premium to peers using multiples, or justifies more optimistic growth assumptions in a DCF.

3. Worked Illustrations

Illustration 8.1 — Goodwill by Super Profit Method

Average Profit for the last 5 years = ₹18,00,000. Capital Employed = ₹80,00,000. Normal Rate of Return in the industry = 15%. Goodwill is to be valued at 3 years' purchase of super profit.

How to Read This Problem: A goodwill valuation question using the Super Profit method, giving average profit, capital employed, and a normal rate of return — this tests the two-step logic of first finding what's 'super' about the profit before capitalising it.

Solution Approach: Compute Normal Profit first (capital employed × normal rate), subtract from Average Profit to isolate Super Profit, then multiply by the given number of years' purchase — resist the temptation to multiply Average Profit directly by years' purchase, which is a very common shortcut error.

STEP-BY-STEP SOLUTION

Step 1 — Normal Profit: $15\% \times 80,00,000 = ₹12,00,000$

Step 2 — Super Profit: Average Profit – Normal Profit = $18,00,000 - 12,00,000 = ₹6,00,000$

Step 3 — Goodwill: Super Profit × Years' Purchase = $6,00,000 \times 3 = ₹18,00,000$

Interpretation: Goodwill valued at ₹18,00,000, reflecting the firm's ability to earn ₹6,00,000 above the industry-normal return, capitalised over 3 years.

Illustration 8.2 — EVA Calculation

NOPAT = ₹40,00,000. Capital Employed = ₹2,00,00,000. WACC = 13%.

How to Read This Problem: An EVA question giving NOPAT, capital employed, and WACC — a compact, single-formula computation, but the interpretation (was value created or destroyed?) is just as important as the arithmetic for full marks.

Solution Approach: Compute the capital charge first (capital employed × WACC) as a standalone figure, then subtract it from NOPAT. State explicitly whether the result is positive (value created) or negative (value destroyed) as part of your answer, not just the number itself.

STEP-BY-STEP SOLUTION

Step 1 — Capital Charge: $2,00,00,000 \times 13\% = ₹26,00,000$

Step 2 — EVA: EVA = NOPAT – Capital Charge = $40,00,000 - 26,00,000 = ₹14,00,000$

Interpretation: A positive EVA of ₹14,00,000 shows the firm generated returns well above its cost of capital, indicating genuine economic value creation for shareholders — a positive signal supporting the firm's valuation.

4. Practice MCQs (15 × 2 Marks)

Q1. Super Profit is calculated as:

- A. Average Profit + Normal Profit
- B. Average Profit – Normal Profit
- C. Normal Profit – Average Profit
- D. Average Profit × Normal Profit

Answer: B

Super profit measures the excess of actual (average) profit over what would be "normal" for the capital employed and industry risk level.

Q2. Under the Capitalisation Method, Goodwill is calculated as:

- A. Super Profit × Normal Rate of Return
- B. Super Profit / Normal Rate of Return
- C. Average Profit / Number of Years
- D. Capital Employed × Super Profit

Answer: B

The capitalisation method effectively "capitalises" super profit at the normal rate of return to arrive at a lump-sum goodwill value.

Q3. The Relief-from-Royalty method is most commonly used to value:

- A. Inventory
- B. Brands and trademarks
- C. Cash and bank balances
- D. Trade receivables

Answer: B

This method estimates brand value based on the royalty a firm would hypothetically pay to license the brand if it didn't already own it.

Q4. Economic Value Added (EVA) is positive when:

- A. NOPAT is less than the capital charge (Capital Employed × WACC)
- B. NOPAT exceeds the capital charge (Capital Employed × WACC)
- C. Capital Employed is zero
- D. WACC is negative

Answer: B

$EVA = NOPAT - (Capital\ Employed \times WACC)$; it is positive when the firm earns more than its cost of capital on the capital deployed.

Q5. Market Value Added (MVA) is calculated as:

- A. Market Value of the Firm minus Total Capital Invested
- B. NOPAT minus Capital Charge
- C. Total Capital Invested minus Net Income
- D. Book Value of Equity only

Answer: A

MVA reflects the cumulative value the firm has added above the capital that was originally invested in it.

Q6. If Average Profit = ₹20,00,000, Capital Employed = ₹1,00,00,000, and Normal Rate of Return = 12%, the Super Profit is:

- A. ₹6,00,000
- B. ₹8,00,000
- C. ₹12,00,000
- D. ₹20,00,000

Answer: B

Normal Profit = $12\% \times 1,00,00,000 = 12,00,000$. Super Profit = $20,00,000 - 12,00,000 = ₹8,00,000$.

Q7. The Multi-Period Excess Earnings Method (MEEM) is typically used to value:

- A. Cash and cash equivalents
- B. Customer relationships or acquired technology intangibles
- C. Physical inventory only
- D. Long-term debt

Answer: B

MEEM isolates cash flows attributable specifically to an intangible like customer relationships or technology, after charging for the use of other supporting assets.

Q8. In MEEM, "Contributory Asset Charges" represent:

- A. A charge to remove the value contributed by OTHER assets (e.g., working capital, fixed assets) used alongside the intangible
- B. The total revenue of the firm
- C. Depreciation on the intangible itself
- D. Corporate income tax

Answer: A

These charges "rent out" the contribution of other assets used in generating the cash flows, isolating the value attributable purely to the specific intangible being valued.

Q9. If Actual Average Profit is LOWER than Normal Profit, Super Profit (and hence goodwill under this method) is treated as:

- A. A large negative value to be subtracted from other assets
- B. Nil (goodwill is not recognised as negative in practice)
- C. Automatically doubled
- D. Irrelevant to the calculation

Answer: B

Since goodwill represents a premium for above-normal earning capacity, a negative super profit simply results in nil goodwill, not a negative asset value.

Q10. The Annuity Method of goodwill valuation differs from the simple Years' Purchase method because it:

- A. Ignores the time value of money entirely
- B. Explicitly discounts the super profit stream to present value using an annuity factor
- C. Uses only the market approach
- D. Requires no super profit calculation at all

Answer: B

The annuity method applies a present value annuity factor to the super profit stream, recognising the time value of money — unlike the simple undiscounted multiplication in the basic Years' Purchase method.

Q11. A consistently positive and growing EVA over several years is generally seen as evidence of:

- A. Value destruction for shareholders
- B. Genuine, sustained shareholder value creation
- C. Excessive risk-taking with no benefit
- D. Declining profitability

Answer: B

Sustained positive EVA indicates the firm consistently earns above its cost of capital, a strong signal of real economic value creation.

Q12. If a firm's Market Value is LESS than its Total Capital Invested, its MVA is:

- A. Positive
- B. Negative, indicating value destruction relative to capital invested
- C. Always zero
- D. Undefined

Answer: B

A negative MVA means the market values the firm below what was originally invested — a sign that capital deployed hasn't created net value.

Q13. Normal Profit in the goodwill valuation context is calculated as:

- A. Capital Employed / Normal Rate of Return
- B. Capital Employed × Normal Rate of Return
- C. Average Profit / Capital Employed
- D. Super Profit × Years' Purchase

Answer: B

Normal Profit = Capital Employed × Normal Rate of Return, representing the return the industry would consider "normal" for that level of capital and risk.

Q14. EVA differs from simple accounting profit (Net Income) mainly because EVA:

- A. Ignores the cost of capital entirely
- B. Explicitly deducts a charge for the cost of ALL capital employed (both debt and equity), not just interest expense
- C. Is identical to Net Income in every case
- D. Only considers the cost of debt

Answer: B

Unlike accounting profit (which only deducts interest on debt), EVA charges for the FULL cost of capital, including the often-overlooked cost of equity.

Q15. Valuing goodwill/intangibles is particularly important in which type of transaction?

- A. Routine day-to-day inventory purchases
- B. Mergers, acquisitions, and business combinations, where purchase price allocation requires identifying and valuing intangible assets separately
- C. Payroll processing
- D. Petty cash reconciliation

Answer: B

In M&A accounting, the purchase price must be allocated across identifiable tangible and intangible assets (including goodwill as the residual), making intangible valuation critical.

Valuation in Mergers & Acquisitions

Share exchange/swap ratios, synergy valuation, post-merger EPS impact (accretion/dilution analysis), and purchase consideration methods in M&A transactions.

1. Formulas

Swap Ratio (based on EPS)

$$\text{Swap Ratio} = \text{EPS of Target Company} / \text{EPS of Acquiring Company}$$

Determines how many shares of the Acquirer are issued for each share of the Target — one of several bases used (others include Net Asset Value per share, Market Price per share, or a weighted combination).

Number of New Shares to be Issued

$$\text{New Shares Issued} = \text{Swap Ratio} \times \text{Number of Target's Outstanding Shares}$$

These new shares are issued by the Acquirer to the Target's shareholders as consideration for the merger/acquisition.

Post-Merger (Combined) EPS

$$\text{Post-Merger EPS} = (\text{Acquirer's Net Income} + \text{Target's Net Income} + \text{Synergy Benefits}) / (\text{Acquirer's Existing Shares} + \text{New Shares Issued})$$

Compare this to the Acquirer's PRE-merger EPS to determine if the deal is EPS-accretive (higher) or EPS-dilutive (lower).

Synergy Value

$$\text{Synergy Value} = \text{Value of Combined Entity (Post-Merger)} - [\text{Standalone Value of Acquirer} + \text{Standalone Value of Target}]$$

Positive synergy justifies paying a premium over the target's standalone value — can arise from cost savings, revenue enhancement, or tax benefits.

Maximum Purchase Price (Break-even for Acquirer)

$$\text{Maximum Price} = \text{Target's Standalone Value} + \text{Synergy Value expected to be realised}$$

Paying more than this means the Acquirer is transferring ALL the synergy value (and possibly more) to the Target's shareholders, destroying value for its own shareholders.

Purchase Consideration (Net Asset / Net Payment Method)

$$\text{Purchase Consideration} = \text{Agreed Value of Assets Taken Over} - \text{Agreed Value of Liabilities Taken Over}$$

Alternative methods include the Lump Sum method (a single negotiated figure) and the Shares Exchange method (using the swap ratio above).

2. Practical Application

Accretion/Dilution — why it matters: Even a strategically sound acquisition can be EPS-dilutive in the short run if the acquirer overpays or issues too many new shares — management/investors often scrutinise this heavily, even though EPS impact alone shouldn't be the sole basis for a merger decision.

Swap ratio choice affects fairness perception: Using EPS-based swap ratios can favour whichever company has a temporarily inflated/deflated EPS (e.g., due to one-off items) — a Fairness Opinion typically considers MULTIPLE bases (EPS, NAV, market price, DCF) and a blended/weighted ratio.

Overpaying destroys value: If the purchase price exceeds standalone value + realistically achievable synergy, the ACQUIRER's shareholders bear a wealth transfer to the TARGET's shareholders — a very common exam discussion point on M&A value destruction ("winner's curse").

3. Worked Illustrations

Illustration 9.1 — Swap Ratio & New Shares Issued

Acquirer's EPS = ₹10; Target's EPS = ₹6. Target has 5,00,000 outstanding shares.

How to Read This Problem: A share-swap ratio question giving each company's EPS and the target's number of outstanding shares — this is a direct two-step application: find the ratio, then scale it up to actual share numbers.

Solution Approach: Compute the swap ratio first as a simple division of the two EPS figures (target ÷ acquirer), then multiply that ratio by the target's total outstanding shares to get the actual number of new shares to be issued — keep the ratio and the share count as two clearly separate, sequential answers.

STEP-BY-STEP SOLUTION

Step 1 — Swap Ratio: Swap Ratio = Target's EPS / Acquirer's EPS = $6/10 = 0.6$

Step 2 — New Shares to be Issued: $0.6 \times 5,00,000 = 3,00,000$ new shares

Interpretation: The Acquirer must issue 3,00,000 new shares (0.6 shares of Acquirer for every 1 share of Target) to Target's shareholders as merger consideration, based on the EPS-swap basis.

Illustration 9.2 — Post-Merger EPS & Accretion/Dilution Analysis

Acquirer: Net Income = ₹50,00,000, Existing Shares = 10,00,000 (Pre-merger EPS = ₹5). Target: Net Income = ₹20,00,000. New shares to be issued to Target's shareholders = 3,00,000. Expected annual synergy benefit = ₹5,00,000.

How to Read This Problem: An accretion/dilution question giving both companies' net incomes, share counts, an expected synergy figure, and the new shares to be issued — this tests whether you can build a POST-merger EPS from scratch and then correctly compare it to the PRE-merger position.

Solution Approach: Combine both companies' net incomes plus synergy first to get total post-merger income, then combine the acquirer's existing shares with the newly issued shares to get total post-merger share count, divide the two to get Post-Merger EPS, and only then compare against the Acquirer's own PRE-merger EPS to conclude accretive or dilutive.

STEP-BY-STEP SOLUTION

Step 1 — Combined Net Income (post-merger, including synergy): $50,00,000 + 20,00,000 + 5,00,000 = ₹75,00,000$

Step 2 — Total shares post-merger: $10,00,000$ (existing) + $3,00,000$ (new) = **13,00,000 shares**

Step 3 — Post-Merger EPS: $75,00,000 / 13,00,000 = ₹5.77$

Step 4 — Compare to Pre-Merger EPS: Pre-Merger EPS = ₹5.00; Post-Merger EPS = ₹5.77

Interpretation: Since Post-Merger EPS (₹5.77) exceeds the Acquirer's Pre-Merger EPS (₹5.00), the deal is EPS-ACCRETIVE — a positive signal, though management should still assess whether the underlying strategic rationale and synergy assumptions are realistic.

4. Practice MCQs (15 × 2 Marks)

Q1. Swap Ratio based on EPS is calculated as:

- A. Acquirer's EPS / Target's EPS
- B. Target's EPS / Acquirer's EPS
- C. Acquirer's EPS × Target's EPS

D. Target's Net Income / Acquirer's Net Income

Answer: B

The EPS-based swap ratio divides the Target's EPS by the Acquirer's EPS to determine the exchange ratio for shares.

Q2. A merger is considered "EPS-accretive" for the Acquirer when:

- A. Post-merger EPS is lower than pre-merger EPS
- B. Post-merger EPS is higher than the Acquirer's pre-merger EPS
- C. EPS is unaffected by the merger
- D. The Target's shareholders receive no shares

Answer: B

Accretion means the deal increases the Acquirer's EPS relative to what it was before the merger.

Q3. Synergy Value in an M&A transaction is defined as:

- A. The sum of the standalone values of both companies, with no additional benefit
- B. The value of the combined entity MINUS the sum of the standalone values of the Acquirer and Target
- C. Only the cost savings from headcount reduction
- D. The purchase price paid, regardless of any value created

Answer: B

Synergy captures the INCREMENTAL value created by combining the two businesses, beyond what they were worth separately.

Q4. If an Acquirer pays MORE than the Target's standalone value plus realistically achievable synergy, the result is typically:

- A. Value creation for the Acquirer's shareholders
- B. A wealth transfer from the Acquirer's shareholders to the Target's shareholders, destroying value for the Acquirer
- C. No impact on either company
- D. Automatic EPS accretion

Answer: B

Overpaying beyond standalone value plus synergy transfers value to the Target's shareholders at the Acquirer shareholders' expense — the classic "winner's curse" in M&A.

Q5. If Acquirer's EPS = ₹8 and Target's EPS = ₹4, the Swap Ratio (EPS basis) is:

- A. 0.5
- B. 1.0
- C. 2.0
- D. 4.0

Answer: A

Swap Ratio = Target EPS/Acquirer EPS = $4/8 = 0.5$.

Q6. A Fairness Opinion for a merger typically evaluates the swap ratio using:

- A. Only the EPS basis, ignoring all other factors
- B. Multiple bases (EPS, NAV, market price, DCF) to arrive at a balanced/weighted ratio
- C. A ratio fixed arbitrarily by the Acquirer alone
- D. Only the book value of assets

Answer: B

A robust fairness opinion considers several valuation bases to avoid bias from any single (potentially distorted) metric.

Q7. Purchase Consideration under the Net Asset Method is computed as:

- A. Agreed Value of Assets taken over + Agreed Value of Liabilities taken over
- B. Agreed Value of Assets taken over – Agreed Value of Liabilities taken over
- C. Only the book value of share capital
- D. Market capitalisation of the Acquirer

Answer: B

Under the Net Asset (Net Payment) Method, consideration equals the net value of identifiable assets taken over, after deducting liabilities assumed.

Q8. Why is EPS accretion/dilution alone considered an insufficient basis for evaluating a merger?

- A. EPS is the only metric that ever matters
- B. A deal can be EPS-accretive in the short run yet strategically unsound, or vice versa, depending on synergy realism and long-term value creation
- C. EPS is unrelated to shareholder value
- D. EPS accretion guarantees a good acquisition price was paid

Answer: B

A deal might show short-term EPS accretion (e.g., from favourable financing) while destroying long-term value, or vice versa — EPS impact should be one input among several, not the sole decision criterion.

Q9. If a target has 2,00,000 shares outstanding and the agreed swap ratio is 0.8, the number of new shares the Acquirer must issue is:

- A. 1,00,000
- B. 1,60,000
- C. 2,00,000
- D. 2,50,000

Answer: B

New Shares = Swap Ratio × Target's Shares = $0.8 \times 2,00,000 = 1,60,000$.

Q10. The "Maximum Purchase Price" an Acquirer should rationally pay for a Target is:

- A. Any price the Target demands
- B. The Target's standalone value plus the realistically achievable synergy value
- C. Always equal to the Target's book value only
- D. Unrelated to synergy considerations

Answer: B

Paying up to standalone value plus expected synergy ensures the Acquirer doesn't give away value created by the deal — paying more transfers value to the seller.

Q11. Cash consideration (as opposed to share-swap consideration) in an M&A deal:

- A. Never affects the Acquirer's EPS
- B. Avoids diluting the Acquirer's existing shareholders' ownership percentage, unlike issuing new shares
- C. Is always preferred by Target shareholders over shares
- D. Requires no valuation of the Target at all

Answer: B

Paying in cash (rather than issuing new shares) means existing Acquirer shareholders retain their same ownership percentage, avoiding equity dilution from new share issuance.

Q12. Which of the following is a common SOURCE of synergy in mergers?

- A. Duplication of overlapping functions with no cost reduction
- B. Cost savings from economies of scale, revenue enhancement from cross-selling, or tax benefits
- C. Guaranteed EPS dilution
- D. Automatic increase in the combined firm's risk with no offsetting benefit

Answer: B

Synergies commonly arise from cost reduction (economies of scale, eliminating duplicate functions), revenue growth (cross-selling, expanded market reach), or financial/tax efficiencies.

Q13. A "reverse merger" typically refers to a situation where:

- A. A larger, publicly listed company acquires a much smaller private company in the conventional manner
- B. A private company effectively takes control of (or merges into) a smaller, publicly listed "shell" company to achieve a public listing indirectly
- C. Two identical-sized companies merge with no listing implications
- D. A company simply changes its name

Answer: B

In a reverse merger, a private company gains public listing status by merging into an already-listed (often shell) company, bypassing a traditional IPO process.

Q14. Cross-border mergers add complexity primarily due to:

- A. Identical regulatory, tax, and accounting frameworks across all countries
- B. Differing regulatory approvals, tax regimes, currency/exchange rate risk, and cultural/legal integration challenges
- C. No need for any valuation at all
- D. Guaranteed synergy realisation with no execution risk

Answer: B

Cross-border deals must navigate multiple, often differing, legal, tax, regulatory, and currency environments, adding significant complexity beyond a domestic merger.

Q15. A "defensive mechanism" against a hostile takeover, such as a poison pill, is primarily designed to:

- A. Make the target company more attractive and easier to acquire quickly
- B. Make an unwanted/hostile acquisition more difficult, costly, or unattractive for the acquirer
- C. Guarantee automatic approval of any takeover bid
- D. Eliminate the need for any shareholder approval in mergers

Answer: B

Defensive mechanisms like poison pills are structured to deter or complicate an unsolicited/hostile takeover attempt, protecting the target from an undesired acquisition.

PART IV · PAPER 18

Corporate Financial Reporting (CFR)

Specific Ind AS, share/asset valuation, financial instruments, NBFCs, business combinations, consolidation, recent developments, and government accounting — 8 modules, 120 MCQs.

6 Sections

8 Modules

120 MCQs

SECTION A

Indian Accounting Standards

Weightage: 25% of total marks (highest-weighted section) | Module 1

Specific Accounting Standards

Key Ind AS covered: Ind AS 8 (Accounting Policies), 12 (Income Taxes), 16 (PPE), 116 (Leases), 21 (Forex), 23 (Borrowing Costs), 36 (Impairment), 38 (Intangibles), 102 (Share-based Payment), 108 (Segments), 113 (Fair Value), 115 (Revenue).

1. Formulas

Ind AS 12 — Deferred Tax

Deferred Tax Asset/Liability = Temporary Difference × Applicable Tax Rate

Taxable temporary difference → Deferred Tax Liability; Deductible temporary difference → Deferred Tax Asset (recognised only to the extent future taxable profit is probable).

Ind AS 16 — Depreciable Amount & Depreciation

Depreciable Amount = Cost of Asset - Residual Value

Straight-Line Depreciation = Depreciable Amount / Useful Life

Depreciation must be reviewed and split component-wise if significant parts of an asset have materially different useful lives (component accounting).

Ind AS 116 — Right-of-Use (ROU) Asset & Lease Liability

Lease Liability (initial) = PV of unpaid lease payments, discounted at the Incremental Borrowing Rate (or rate implicit in the lease)

ROU Asset = Initial Lease Liability + Initial Direct Costs + Prepaid Lease Payments - Lease Incentives Received

Almost all leases (except short-term/low-value) are now recognised on-balance-sheet by the lessee under Ind AS 116 — a major shift from the old operating/finance lease distinction.

Ind AS 23 — Capitalisation Rate for Borrowing Costs

Capitalisation Rate = Weighted Average Cost of General Borrowings Outstanding During the Period

Applied to expenditure on a qualifying asset (financed from general borrowings) to determine the borrowing cost eligible for capitalisation.

Ind AS 36 — Impairment of Assets

Recoverable Amount = Higher of (Fair Value less Costs of Disposal, Value in Use)

Impairment Loss = Carrying Amount - Recoverable Amount (recognised only if Carrying Amount > Recoverable Amount)

Value in Use = PV of estimated future cash flows expected from continuing use and eventual disposal of the asset.

Ind AS 108 — Operating Segment Thresholds

A segment is "reportable" if it meets ANY of: Revenue ≥ 10% of combined revenue; OR Absolute Profit/Loss ≥ 10% of the greater of combined profits/combined losses; OR Assets ≥ 10% of combined assets of all segments

If total external revenue of reportable segments is <75% of total entity revenue, additional segments must be identified until the 75% threshold is reached.

Ind AS 115 — Revenue Recognition (5-Step Model)

1. Identify the contract 2. Identify performance obligations 3. Determine transaction price 4. Allocate transaction price to performance obligations 5. Recognise revenue as/when each obligation is satisfied

For bundled contracts, allocate the transaction price to each distinct performance obligation based on its relative standalone selling price.

2. Practical Application

Ind AS 116 impact on financial ratios: Bringing operating leases on-balance-sheet increases both assets and liabilities, typically worsening debt-based ratios (e.g., Debt/Equity) while EBITDA improves (since lease "rent" is replaced by depreciation + interest, both below the EBITDA line) — a key exam discussion point.

Deferred tax on revaluation: When an asset is revalued upward under Ind AS 16, the resulting temporary difference (Carrying Amount > Tax Base) creates a Deferred Tax Liability, recognised directly in Other Comprehensive Income (matching where the revaluation gain itself was recognised) — not in P&L.

Impairment testing triggers: Ind AS 36 requires impairment testing whenever there's an indicator of impairment (external: market value decline, adverse changes in the economic environment; internal: physical damage, obsolescence) — certain assets (goodwill, indefinite-life intangibles) require ANNUAL testing regardless of indicators.

3. Worked Illustrations

Illustration 1.1 — Deferred Tax (Ind AS 12)

An asset has a Carrying Amount of ₹10,00,000 and a Tax Base (WDV as per tax records) of ₹7,00,000, due to higher depreciation claimed for tax purposes. Tax Rate = 25%.

How to Read This Problem: A deferred tax question giving an asset's carrying amount and its tax base separately — the entire question hinges on correctly identifying which figure is bigger, since that single comparison determines whether you're computing a DTA or a DTL.

Solution Approach: Subtract Tax Base from Carrying Amount first to find the temporary difference and its sign. If Carrying Amount is bigger, it's a taxable temporary difference (DTL); if Tax Base is bigger, it's a deductible temporary difference (DTA). Only then multiply by the tax rate.

STEP-BY-STEP SOLUTION

Step 1 — Identify the temporary difference: Carrying Amount > Tax Base $\Rightarrow$ Taxable temporary difference = $10,00,000 - 7,00,000 = ₹3,00,000$

Step 2 — Nature of difference: Since the carrying amount for accounting purposes exceeds the tax base, this will result in higher taxable income in future (when the asset is realised/depreciated for tax purposes) — a Deferred Tax LIABILITY.

Step 3 — Compute DTL: $DTL = 3,00,000 \times 25\% = ₹75,000$

Interpretation: A Deferred Tax Liability of ₹75,000 must be recognised, representing the additional tax the entity will pay in future periods as this temporary difference reverses.

Illustration 1.2 — Impairment of Assets (Ind AS 36)

An asset has a Carrying Amount of ₹50,00,000. Fair Value less Costs of Disposal = ₹38,00,000. Value in Use (PV of future cash flows) = ₹42,00,000.

How to Read This Problem: An impairment question giving fair value less costs of disposal AND value in use separately, alongside the asset's carrying amount — recognise that finding recoverable amount is a two-part 'choose the higher of two numbers' step before any impairment loss can be computed.

Solution Approach: Take the higher of the two recoverable amount inputs first, compare that single figure against carrying amount, and only recognise an impairment loss if carrying amount is higher — if recoverable amount turns out higher than carrying amount, state clearly that NO impairment loss arises.

STEP-BY-STEP SOLUTION

Step 1 — Determine Recoverable Amount: Recoverable Amount = Higher of (38,00,000, 42,00,000) = ₹42,00,000

Step 2 — Compare with Carrying Amount: Carrying Amount (50,00,000) > Recoverable Amount (42,00,000) $\Rightarrow$ Asset IS impaired

Step 3 — Compute Impairment Loss: Impairment Loss = 50,00,000 – 42,00,000 = ₹8,00,000

Interpretation: An impairment loss of ₹8,00,000 must be recognised in profit or loss (unless the asset is carried at a revalued amount, in which case it first reduces the revaluation surplus), writing the asset down to its recoverable amount of ₹42,00,000.

4. Practice MCQs (15 × 2 Marks)

Q1. Under Ind AS 36, Recoverable Amount is defined as:

- A. The lower of Fair Value less Costs of Disposal and Value in Use
- B. The higher of Fair Value less Costs of Disposal and Value in Use
- C. Always equal to the historical cost
- D. Always equal to the market price alone

Answer: B

Recoverable Amount takes the higher of the two measures, since the entity would rationally choose whichever route (sale or continued use) yields more value.

Q2. When Carrying Amount of an asset exceeds its Tax Base, this creates a:

- A. Deferred Tax Asset
- B. Deferred Tax Liability
- C. No deferred tax impact
- D. Immediate cash tax refund

Answer: B

A carrying amount exceeding the tax base is a taxable temporary difference, giving rise to a Deferred Tax Liability.

Q3. Under Ind AS 116, which of the following leases can a lessee elect to keep OFF the balance sheet?

- A. Any lease longer than 5 years
- B. Short-term leases (≤ 12 months) and leases of low-value assets
- C. All operating leases without exception
- D. Only finance leases

Answer: B

Ind AS 116 provides practical expedients allowing lessees to expense short-term and low-value asset leases directly, without recognising a Right-of-Use asset/liability.

Q4. Under Ind AS 115, revenue is recognised:

- A. Only when cash is received
- B. As/when each distinct performance obligation in the contract is satisfied
- C. Always at the start of the contract, in full
- D. Only at the end of the entity's financial year

Answer: B

The 5-step Ind AS 115 model recognises revenue progressively as performance obligations are satisfied, not simply on cash receipt or contract signing.

Q5. The Capitalisation Rate under Ind AS 23, for general (not asset-specific) borrowings, is calculated as:

- A. The highest individual borrowing rate available
- B. The weighted average cost of the general borrowings outstanding during the period
- C. The risk-free government bond rate
- D. Always a flat 10%

Answer: B

Since general borrowings are pooled and not tied to a specific asset, a weighted average rate is used to determine capitalisable borrowing costs.

Q6. Bringing operating leases on-balance-sheet under Ind AS 116 typically:

- A. Decreases both total assets and total liabilities
- B. Increases both total assets (ROU asset) and total liabilities (lease liability), and tends to improve reported EBITDA

- C. Has no effect on any financial statement
- D. Only affects the cash flow statement, not the balance sheet

Answer: B

Recognising ROU assets and lease liabilities grosses up the balance sheet; since rent expense is replaced by depreciation+interest (both below EBITDA), reported EBITDA typically rises.

Q7. Under Ind AS 108, a segment is reportable if its revenue is at least what percentage of the combined revenue of all segments?

- A. 5%
- B. 10%
- C. 25%
- D. 50%

Answer: B

The 10% quantitative threshold on revenue (or profit/loss, or assets) is one of the standard tests for identifying a reportable operating segment.

Q8. If the total external revenue of currently identified reportable segments is less than 75% of the entity's total revenue, the entity must:

- A. Stop reporting segment information entirely
- B. Identify additional reportable segments until the 75% threshold is met
- C. Merge all segments into one
- D. Ignore the 75% test, as it is optional

Answer: B

Ind AS 108 requires enough segments to be separately reported so that at least 75% of total entity revenue is covered by reportable segments.

Q9. A deferred tax liability arising from the revaluation of a Property, Plant & Equipment item (Ind AS 16) is recognised in:

- A. Profit or Loss
- B. Other Comprehensive Income, consistent with where the revaluation gain itself was recognised
- C. Retained earnings directly, bypassing OCI
- D. It is never recognised

Answer: B

Since the revaluation surplus is recognised in OCI, the related deferred tax effect is also recognised in OCI, maintaining consistency of treatment.

Q10. Under Ind AS 36, goodwill and indefinite-life intangible assets must be tested for impairment:

- A. Only when there's a specific indicator of impairment
- B. Annually, regardless of whether there is any indication of impairment
- C. Never, since goodwill cannot be impaired
- D. Only once, at initial recognition

Answer: B

Unlike other assets (tested only when indicators exist), goodwill and indefinite-life intangibles require mandatory annual impairment testing.

Q11. Value in Use, as defined under Ind AS 36, is calculated as:

- A. The current market selling price of the asset
- B. The present value of estimated future cash flows expected from the asset's continuing use and eventual disposal
- C. The historical cost of the asset
- D. The replacement cost of the asset

Answer: B

Value in Use captures the entity-specific PV of cash flows the asset is expected to generate, distinct from its market-based fair value.

Q12. Ind AS 21 requires monetary items denominated in a foreign currency to be translated, at each reporting date, using:

- A. The historical exchange rate at the transaction date
- B. The closing (spot) exchange rate at the reporting date
- C. An average rate for the entire year, always
- D. A rate fixed by the company's management arbitrarily

Answer: B

Monetary items (cash, receivables, payables in foreign currency) are retranslated at the closing rate at each reporting date, with exchange differences recognised in P&L.

Q13. Ind AS 102 (Share-Based Payment) requires the cost of employee stock options to be measured based on:

- A. The par value of the shares only
- B. The fair value of the equity instruments granted, at the grant date
- C. The book value of the company's total assets
- D. Zero cost, since no cash changes hands

Answer: B

Ind AS 102 requires recognition of an expense based on the grant-date fair value of the options/shares granted to employees, spread over the vesting period.

Q14. Under Ind AS 113, the "Fair Value Hierarchy" prioritises which level of inputs as most reliable?

- A. Level 3 — unobservable inputs based on management's own assumptions
- B. Level 1 — quoted prices in active markets for identical assets/liabilities
- C. Level 2 and Level 3 equally
- D. There is no hierarchy; all inputs are treated equally

Answer: B

Level 1 inputs (quoted prices in active markets) are considered the most reliable and are given the highest priority in the fair value hierarchy.

Q15. Component accounting under Ind AS 16 requires that:

- A. An entire asset must always be depreciated as a single unit, regardless of its components
- B. Significant parts of an asset with materially different useful lives are depreciated separately
- C. Depreciation is prohibited under Ind AS 16
- D. Only the largest component of an asset needs to be recorded

Answer: B

Component accounting requires separately identifying and depreciating significant parts of an asset that have different useful lives from the asset as a whole.

SECTION B

Valuation of Shares, Financial Instruments & NBFCs

Weightage: 15% of total marks | Modules 2–4

Valuation of Shares

Methods for valuing unquoted/private company shares — Net Assets, Yield (Earnings) and Fair Value methods — plus goodwill and asset revaluation adjustments feeding into the valuation.

1. Formulas

Net Asset Value (NAV) Method

Value per Share = Net Assets Available to Equity Shareholders / Number of Equity Shares

Net Assets Available to Equity = Total Assets (at agreed/fair values) – Total Outside Liabilities – Preference Share Capital (including any arrears of preference dividend, if cumulative).

Yield (Earnings) Method

Value per Share = (Expected Rate of Return / Normal Rate of Return) × Paid-Up Value per Share

Expected Rate of Return = (Average/Maintainable Profit available to equity / Paid-up Equity Capital) × 100. Reflects the earning capacity of the business rather than its net assets.

Fair Value Method

Fair Value per Share = (Net Asset Value per Share + Yield Value per Share) / 2

A common compromise/practical approach, balancing the asset backing view (NAV) with the earning capacity view (Yield) — the simple average is the most typical weighting used in exams unless a different weighting is specified.

Maintainable Profit (for Yield Method)

Maintainable Profit = Average of Past Adjusted Profits, after removing non-recurring items (abnormal gains/losses, one-off items) and adjusting for expected future normal conditions

This is the "normalised" profit figure that best represents ongoing, sustainable earning capacity — NOT simply the last reported year's profit.

Capitalisation of Earnings Method (alternative Yield-based approach)

Value of Business (Equity) = Maintainable Profit / Normal Rate of Return; Value per Share = Value of Business / Number of Shares

Directly capitalises the maintainable profit at the normal (expected) rate of return to arrive at total equity value.

2. Practical Application

When each method is most relevant: NAV method suits liquidation/asset-heavy scenarios; Yield method suits going-concern, profit-generating businesses; Fair Value method is commonly used for statutory/regulatory purposes (e.g., transfer pricing, family settlements) needing a balanced, defensible figure.

Adjustments before computing NAV: Assets must be revalued to fair/agreed value (not book value), contingent liabilities likely to crystallise must be provided for, and fictitious assets (e.g., preliminary expenses, debit balance in P&L) must be written off before computing net assets.

Preference shares in NAV calculation: Preference share capital (plus arrears of cumulative preference dividend, if any) is deducted BEFORE arriving at net assets available to equity shareholders — a frequently tested adjustment.

3. Worked Illustration

Illustration 2.1 — Fair Value of Shares (NAV & Yield Combined)

Total Assets (at agreed values) = ₹1,20,00,000; Total Outside Liabilities = ₹40,00,000; 10% Preference Share Capital = ₹20,00,000 (no arrears); Equity Shares = 5,00,000 of ₹10 each. Maintainable Profit (after preference dividend) = ₹9,00,000. Normal Rate of Return in the industry = 12%.

How to Read This Problem: A share valuation question combining both NAV and Yield methods in one problem — this is testing whether you can build TWO independent valuations (one asset-based, one earnings-based) and then correctly combine them into a Fair Value.

Solution Approach: Compute Net Assets available to equity first (don't forget to deduct preference capital), divide by equity shares for NAV per share. Separately compute the expected rate of return from the given maintainable profit and paid-up capital, then scale the paid-up value by the ratio of expected-to-normal return for Yield Value. Average the two only at the very end.

STEP-BY-STEP SOLUTION

Step 1 — Net Assets available to Equity: $1,20,00,000 - 40,00,000 - 20,00,000 = ₹60,00,000$

Step 2 — NAV per share: $60,00,000 / 5,00,000 = ₹12 \text{ per share}$

Step 3 — Expected Rate of Return: $(9,00,000 / 50,00,000 \text{ paid-up equity capital}) \times 100 = 18\%$

Step 4 — Yield Value per share: $(18\%/12\%) \times ₹10 \text{ (paid-up value)} = 1.5 \times 10 = ₹15 \text{ per share}$

Step 5 — Fair Value per share: $(12 + 15) / 2 = ₹13.50 \text{ per share}$

Interpretation: Fair Value per share = ₹13.50, balancing the asset-backing view (₹12 NAV) with the stronger earning capacity view (₹15 Yield Value), which shows the business earns above the industry-normal 12% return.

4. Practice MCQs (15 × 2 Marks)

Q1. Under the Net Asset Value method, assets should be valued at:

- A. Historical book value always
- B. Fair/agreed values for the purpose of the valuation
- C. Zero
- D. Only the original purchase price, ignoring depreciation

Answer: B

NAV valuation requires assets to be restated at fair/agreed values, not historical book values, to reflect true current worth.

Q2. Under the Yield Method, Value per Share is calculated as:

- A. $(\text{Normal Rate of Return} / \text{Expected Rate of Return}) \times \text{Paid-up value}$
- B. $(\text{Expected Rate of Return} / \text{Normal Rate of Return}) \times \text{Paid-up value}$
- C. $\text{Expected Rate of Return} \times \text{Normal Rate of Return}$
- D. $\text{Net Assets} / \text{Number of Shares}$

Answer: B

The Yield method scales the paid-up value by the ratio of the company's actual expected return to the industry's normal return.

Q3. Preference share capital (with cumulative arrears, if any) is treated in the NAV method by:

- A. Adding it to net assets
- B. Deducting it (along with any arrears) before arriving at net assets available to equity shareholders
- C. Ignoring it entirely
- D. Multiplying it by the number of equity shares

Answer: B

Preference capital ranks ahead of equity, so it (plus any cumulative dividend arrears) must be deducted before computing net assets attributable to equity holders.

Q4. Maintainable Profit, used in the Yield Method, is best described as:

- A. The exact profit of the most recent year, unadjusted
- B. A normalised average profit figure after removing non-recurring/abnormal items
- C. The company's total revenue
- D. The company's total assets

Answer: B

Maintainable profit represents sustainable, ongoing earning capacity — hence one-off/abnormal items are excluded from the average used.

Q5. Fictitious assets (e.g., preliminary expenses not yet written off) should be treated in NAV computation by:

- A. Including them at full book value as a real asset
- B. Writing them off / excluding them from the asset base before computing net assets
- C. Doubling their value
- D. Treating them as a liability

Answer: B

Fictitious assets have no realisable value, so they are excluded (written off) when computing the true net asset value.

Q6. If NAV per share = ₹20 and Yield Value per share = ₹30, the Fair Value per share (simple average) is:

- A. ₹20
- B. ₹25
- C. ₹30
- D. ₹50

Answer: B

Fair Value = $(20+30)/2 = ₹25$.

Q7. The Yield Method of share valuation is most relevant when the primary concern is:

- A. The company is about to be liquidated
- B. Valuing the business as a going concern, based on its earning capacity
- C. Only the resale value of fixed assets
- D. The company has no future operations planned

Answer: B

The Yield method captures the value of ongoing earning power, making it most suitable for a going-concern business rather than a liquidation scenario.

Q8. Contingent liabilities that are likely to crystallise should be treated, when valuing shares under the NAV method, by:

- A. Ignoring them entirely since they are "contingent"
- B. Providing for them as a liability, reducing net assets accordingly
- C. Adding them to the asset side
- D. Treating them as share capital

Answer: B

If a contingent liability is likely to materialise, prudence requires providing for it, which reduces the net assets available to equity shareholders.

Q9. If a company's Expected Rate of Return (18%) exceeds the industry's Normal Rate of Return (12%), the Yield Value per share compared to the paid-up value per share will be:

- A. Lower than the paid-up value
- B. Higher than the paid-up value
- C. Exactly equal to the paid-up value
- D. Always zero

Answer: B

Since the ratio (Expected/Normal Rate) exceeds 1 in this case, the Yield Value will exceed the paid-up value per share, reflecting above-average earning capacity.

Q10. Under the Capitalisation of Earnings method, Value of Business is calculated as:

- A. Maintainable Profit × Normal Rate of Return
- B. Maintainable Profit / Normal Rate of Return
- C. Net Assets × Number of Shares

D. Paid-up Capital / Maintainable Profit

Answer: B

This method directly capitalises maintainable profit at the normal rate of return to determine the implied value of the entire business/equity.

Q11. Share valuation methods (NAV, Yield, Fair Value) are commonly required for purposes such as:

- A. Only routine day-to-day bookkeeping entries
- B. Mergers, family settlements, taxation (angel tax), and statutory/regulatory compliance
- C. Recording petty cash transactions
- D. Calculating GST liability

Answer: B

Share valuation is required in numerous statutory and commercial contexts, including M&A, family arrangements, and various tax/regulatory compliance requirements.

Q12. If Total Assets (fair value) = ₹80,00,000, Outside Liabilities = ₹30,00,000, and Preference Capital = ₹10,00,000, Net Assets available to Equity is:

- A. ₹30,00,000
- B. ₹40,00,000
- C. ₹50,00,000
- D. ₹60,00,000

Answer: B

Net Assets to Equity = 80,00,000 – 30,00,000 – 10,00,000 = ₹40,00,000.

Q13. Which of these items would typically be EXCLUDED when computing "maintainable" profit for the Yield Method?

- A. Recurring operating income from core business activities
- B. A one-time profit from the sale of a factory building (a non-recurring gain)
- C. Normal cost of goods sold
- D. Regular administrative expenses

Answer: B

Non-recurring items like a one-off asset sale gain distort the picture of sustainable earning capacity and are excluded from maintainable profit.

Q14. A key limitation of the NAV method alone (without considering earnings) is that it:

- A. Always overstates the value of a highly profitable, asset-light business
- B. May understate the value of a business whose worth lies mainly in future earning potential rather than its current asset base
- C. Cannot be calculated at all for any company
- D. Ignores liabilities entirely

Answer: B

A profitable but asset-light business (e.g., a service firm) might be significantly undervalued by NAV alone, since its true worth lies in future earnings, not its net asset base.

Q15. In practice, when an examiner does not specify a particular weighting between NAV and Yield values, the Fair Value is generally computed as:

- A. NAV value alone, ignoring Yield value
- B. A simple (equal-weighted) average of NAV and Yield values
- C. Yield value alone, ignoring NAV
- D. The higher of the two values only

Answer: B

Absent any specified weighting, the standard convention is to take a simple average of the NAV and Yield values as the Fair Value.

Accounting of Financial Instruments

Classification and measurement of financial instruments under Ind AS 109, presentation under Ind AS 32, and the Effective Interest Rate (EIR) and Expected Credit Loss (ECL) models.

1. Formulas

Amortised Cost using the Effective Interest Rate (EIR) Method

Amortised Cost = Initial Recognition Amount – Principal Repayments ± Cumulative Amortisation of Discount/Premium (using EIR) – Impairment Allowance

EIR is the rate that exactly discounts estimated future cash flows through the expected life of the instrument to the instrument's initial carrying amount.

Interest Income under EIR Method

Interest Income (for the period) = Opening Amortised Cost × Effective Interest Rate

This differs from the nominal/coupon interest when the instrument was issued at a discount or premium to its face value.

Expected Credit Loss (ECL) — Ind AS 109

ECL = Probability of Default (PD) × Loss Given Default (LGD) × Exposure at Default (EAD)

"12-month ECL" applies at initial recognition (Stage 1); "Lifetime ECL" applies once credit risk has increased significantly (Stage 2) or the asset is credit-impaired (Stage 3).

Compound Financial Instrument — Split Accounting (Ind AS 32)

Liability Component = PV of contractual cash flows, discounted at the market interest rate for an equivalent NON-convertible instrument

Equity Component = Total Proceeds Received – Liability Component (residual value)

Applies to instruments like convertible bonds/debentures, which contain both a liability (debt) and an equity (conversion option) component that must be separated ("split accounting").

2. Practical Application

Classification categories under Ind AS 109: A debt instrument is classified based on the entity's business model AND the contractual cash flow characteristics — "hold to collect" with SPPI (solely payments of principal and interest) cash flows → Amortised Cost; "hold to collect and sell" with SPPI → FVTOCI; anything else (e.g., trading, equity investments by default) → FVTPL.

Why EIR matters: When a bond/debenture is issued at a discount or premium, using the EIR (rather than the nominal coupon rate) ensures interest income/expense is recognised at a constant rate on the CARRYING amount over the instrument's life — smoothing the effective yield.

ECL is forward-looking: Unlike the old "incurred loss" model (which waited for an actual trigger event), Ind AS 109's ECL model requires recognising expected credit losses based on forward-looking information from the very start — a fundamental shift increasing the timeliness of loss recognition.

3. Worked Illustration

Illustration 3.1 — Amortised Cost using EIR

A company issues a bond with a Face Value of ₹10,00,000 for ₹9,50,000 (at a discount), bearing a nominal coupon of 8% p.a. payable annually. The Effective Interest Rate (EIR), given the discount, works out to approximately 9%.

How to Read This Problem: A financial instrument question giving a bond's issue price (at a discount/premium to face value), its nominal coupon rate, and its effective interest rate — the gap between the two rates is precisely what the question is testing you to amortise correctly.

Solution Approach: Compute interest income using the EFFECTIVE rate applied to the OPENING amortised cost first — this is your 'true' interest income for the period. Separately compute the actual cash coupon using the NOMINAL rate on face value. The difference between the two is the discount/premium amortised for the period, which adjusts the closing amortised cost.

STEP-BY-STEP SOLUTION

Step 1 — Interest Income/Expense for Year 1 (at EIR): Opening Amortised Cost $\times$ EIR = $9,50,000 \times 9\% = ₹85,500$

Step 2 — Actual Coupon Paid (at nominal rate): $10,00,000 \times 8\% = ₹80,000$

Step 3 — Amortisation of Discount for Year 1: EIR-based interest – Actual coupon = $85,500 - 80,000 = ₹5,500$

Step 4 — Closing Amortised Cost: $9,50,000 + 5,500 = ₹9,55,500$

Interpretation: The bond's carrying (amortised cost) value increases from ₹9,50,000 to ₹9,55,500 over Year 1, as the initial discount of ₹50,000 is gradually amortised (unwound) over the bond's life using the effective interest rate of 9%.

4. Practice MCQs (15 $\times$ 2 Marks)

Q1. A debt instrument held under a "hold to collect" business model with SPPI cash flows is classified at:

- A. Fair Value through Profit or Loss (FVTPL)
- B. Amortised Cost
- C. Fair Value through OCI (FVTOCI) always
- D. Historical cost, unadjusted

Answer: B

Instruments held solely to collect contractual cash flows (principal + interest) are measured at Amortised Cost under Ind AS 109.

Q2. The Effective Interest Rate (EIR) is defined as the rate that:

- A. Equals the nominal coupon rate always
- B. Exactly discounts estimated future cash flows over the expected life to the instrument's initial carrying amount
- C. Is set arbitrarily by management
- D. Is always higher than the market rate

Answer: B

EIR is the internal-rate-of-return-style rate that equates the present value of future cash flows to the initial carrying amount of the instrument.

Q3. Ind AS 109's Expected Credit Loss (ECL) model differs from the old "incurred loss" model because ECL:

- A. Only recognises losses after an actual default has occurred
- B. Recognises expected losses based on forward-looking information from the outset, before an actual loss event occurs
- C. Never requires any provision for credit losses
- D. Applies only to equity instruments

Answer: B

ECL is a forward-looking model, requiring earlier recognition of expected losses compared to the reactive, trigger-based "incurred loss" approach.

Q4. In a compound financial instrument (e.g., a convertible debenture), the Equity Component is calculated as:

- A. The full face value of the instrument
- B. Total proceeds received minus the Liability Component (as a residual value)
- C. The market interest rate on similar debt
- D. Always zero

Answer: B

Split accounting values the liability component first (as the PV of cash flows at the market rate for a non-convertible instrument), with the equity component being the residual.

Q5. If a bond is issued at a discount to its face value, the Effective Interest Rate compared to the nominal coupon rate will be:

- A. Lower than the nominal rate
- B. Higher than the nominal rate
- C. Exactly equal to the nominal rate
- D. Always zero

Answer: B

Since the issuer receives less than face value but repays the full face value plus coupons, the effective yield (EIR) exceeds the stated nominal coupon rate.

Q6. "12-month ECL" is applied when a financial asset is in which stage under the Ind AS 109 impairment model?

- A. Stage 1 — no significant increase in credit risk since initial recognition
- B. Stage 3 — the asset is already credit-impaired
- C. Only after the asset has already defaulted
- D. Never applied under Ind AS 109

Answer: A

12-month ECL is the default measurement basis at initial recognition (Stage 1), before any significant deterioration in credit quality.

Q7. ECL is calculated using the formula:

- A. $PD + LGD + EAD$
- B. $PD \times LGD \times EAD$
- C. $PD / LGD / EAD$
- D. $EAD - PD - LGD$

Answer: B

Expected Credit Loss combines Probability of Default, Loss Given Default, and Exposure at Default multiplicatively.

Q8. Equity investments (other than in subsidiaries/associates/JVs) are, by default, measured under Ind AS 109 at:

- A. Amortised Cost
- B. Fair Value through Profit or Loss (FVTPL), unless an irrevocable FVTOCI election is made
- C. Historical cost, never remeasured
- D. Always at par value

Answer: B

Equity investments generally do not qualify for amortised cost (they lack SPPI cash flows) and default to FVTPL unless the entity elects FVTOCI at initial recognition.

Q9. Once a financial asset is credit-impaired (Stage 3), interest income is calculated on:

- A. The gross carrying amount, ignoring impairment
- B. The net carrying amount (amortised cost, after deducting the loss allowance)
- C. The original face value only
- D. Zero — no interest is ever recognised

Answer: B

Once credit-impaired, effective interest is calculated by applying the EIR to the net (amortised cost) carrying amount, i.e., after deducting the loss allowance.

Q10. Ind AS 32 is primarily concerned with the:

- A. Recognition and measurement of financial instruments
- B. Presentation of financial instruments (e.g., classification as liability vs equity)
- C. Disclosure requirements only for banks
- D. Tax treatment of financial instruments

Answer: B

Ind AS 32 governs how financial instruments are presented/classified (liability vs equity), while Ind AS 109 covers recognition and measurement.

Q11. If interest income calculated at EIR exceeds the actual coupon received, the difference represents:

- A. A cash payment to the issuer
- B. Amortisation of a discount, increasing the carrying (amortised cost) value of the instrument

- C. An immediate impairment loss
- D. A reduction in the face value of the instrument

Answer: B

The excess of EIR-based interest income over the cash coupon received represents the unwinding/amortisation of the original discount, added to the carrying value.

Q12. A financial asset held under a "hold to collect and sell" business model, with SPPI cash flows, is measured at:

- A. Amortised Cost
- B. Fair Value through Other Comprehensive Income (FVTOCI)
- C. Fair Value through Profit or Loss (FVTPL)
- D. Historical cost only

Answer: B

This mixed business model (both collecting cash flows and potentially selling) with SPPI-qualifying cash flows leads to FVTOCI classification.

Q13. "SPPI" in the context of Ind AS 109 stands for:

- A. Standard Price Per Instrument
- B. Solely Payments of Principal and Interest
- C. Systematic Portfolio Performance Index
- D. Special Purpose Public Investment

Answer: B

The SPPI test checks whether contractual cash flows represent solely payments of principal and interest on the principal outstanding — a key classification criterion.

Q14. Loss Given Default (LGD), a component of the ECL formula, represents:

- A. The total exposure amount at the time of default
- B. The proportion of the exposure the lender expects to lose if default occurs, after considering recoveries (e.g., from collateral)
- C. The probability that a default will occur at all
- D. The interest rate charged on the loan

Answer: B

LGD captures the expected severity of loss (net of recoveries) in the event that a default actually happens.

Q15. Split accounting for a compound instrument (e.g., convertible bond) is required because it:

- A. Contains both a liability (debt) component and an equity (conversion option) component that must be presented separately
- B. Is always classified fully as equity
- C. Is always classified fully as a liability
- D. Has no financial substance and can be ignored

Answer: A

A compound instrument's economic substance includes both a debt obligation and an equity-like conversion feature, requiring separate presentation of each component.

NBFCs — Provisioning Norms, Accounting & Reporting

Non-Banking Financial Company (NBFC) asset classification, RBI-prescribed provisioning norms, and Capital Adequacy (CRAR) requirements.

1. Formulas

Asset Classification (NPA Categories)

Standard Asset → **Sub-Standard Asset** (overdue > specified period, typically >90 days for NBFC-ND-SI/deposit-taking) → **Doubtful Asset** (remains sub-standard beyond a further specified period) → **Loss Asset** (identified as uncollectible)

Provisioning requirements escalate significantly as an asset moves down this classification chain, reflecting increasing risk of non-recovery.

Provisioning Norms (illustrative RBI-prescribed rates)

Standard Assets: 0.25%–0.40% (varies by asset category)

Sub-Standard Assets: 10% of outstanding amount

Doubtful Assets: 20%/30%/50%/100% of the secured/unsecured portion, depending on the period doubtful

Loss Assets: 100% (entire asset written off/fully provided)

Actual rates are periodically revised by RBI Master Directions — always verify against the CURRENT applicable circular for exam purposes.

Capital to Risk-Weighted Assets Ratio (CRAR)

CRAR = (Tier I Capital + Tier II Capital) / Total Risk-Weighted Assets × 100

RBI mandates a minimum CRAR for NBFCs (the specific minimum percentage varies by NBFC category and is periodically revised) — a key solvency/capital adequacy metric.

Provision on Doubtful Assets — Secured vs Unsecured Split

Total Provision = (100% of Unsecured Portion) + (Applicable % of Secured Portion, based on how long the asset has been doubtful)

The unsecured portion of a doubtful asset is provided for in FULL, regardless of how long it has been doubtful; only the secured portion gets graduated provisioning rates.

2. Practical Application

Why NBFC provisioning matters for financial reporting: Since NBFCs' core business is lending, the adequacy of provisions directly determines reported profit and net worth — under-provisioning can materially overstate an NBFC's financial health, a key area of regulatory and audit scrutiny.

Ind AS ECL vs RBI provisioning norms: NBFCs applying Ind AS must compute provisions under the Ind AS 109 ECL model; however, RBI also prescribes minimum regulatory provisioning — where RBI norms require HIGHER provisioning than ECL, the NBFC must maintain the higher of the two (transferred to a separate "Impairment Reserve" if ECL provision is lower).

CRAR as an early warning indicator: A declining CRAR trend signals eroding capital buffers relative to risk-weighted exposure — regulators use CRAR breaches as a trigger for corrective action, similar to how Altman's Z-Score flags corporate distress.

3. Worked Illustration

Illustration 4.1 — NBFC Provisioning on Asset Classification

An NBFC's loan portfolio (₹ in lakh): Standard Assets ₹800 (provisioning rate 0.40%); Sub-Standard Assets ₹50 (rate 10%); Doubtful Assets (Secured portion) ₹30, doubtful for <1 year (rate 20%); Doubtful Assets (Unsecured portion) ₹10 (rate 100%); Loss Assets ₹5 (rate 100%).

How to Read This Problem: An NBFC provisioning question giving a loan portfolio broken into multiple asset-classification categories, each with a different provisioning rate — and a secured/unsecured split within the doubtful category, which is the detail most likely to be missed.

Solution Approach: Work through the categories in the SAME order they're listed (Standard → Sub-Standard → Doubtful-Secured → Doubtful-Unsecured → Loss), computing each provision independently first before summing. Remember the unsecured portion of a doubtful asset ALWAYS gets 100% provisioning, regardless of how briefly it's been classified doubtful — don't apply the graduated secured-portion rate to it by mistake.

STEP-BY-STEP SOLUTION

Step 1 — Provision on Standard Assets: $800 \times 0.40\% = ₹3.20$ lakh

Step 2 — Provision on Sub-Standard Assets: $50 \times 10\% = ₹5.00$ lakh

Step 3 — Provision on Doubtful Assets (Secured portion): $30 \times 20\% = ₹6.00$ lakh

Step 4 — Provision on Doubtful Assets (Unsecured portion): $10 \times 100\% = ₹10.00$ lakh

Step 5 — Provision on Loss Assets: $5 \times 100\% = ₹5.00$ lakh

Step 6 — Total Provision Required: $3.20 + 5.00 + 6.00 + 10.00 + 5.00 = ₹29.20$ lakh

Interpretation: Total provisioning of ₹29.20 lakh is required across the portfolio — note that the UNSECURED portion of the doubtful asset attracts a full 100% provision, regardless of how briefly it has been classified as doubtful, unlike the graduated rate applied to the secured portion.

4. Practice MCQs (15 × 2 Marks)

Q1. The asset classification categories for an NBFC's loan portfolio, in order of increasing risk, are:

- A. Loss → Doubtful → Sub-Standard → Standard
- B. Standard → Sub-Standard → Doubtful → Loss
- C. Sub-Standard → Standard → Loss → Doubtful
- D. All categories carry identical risk

Answer: B

Assets progressively deteriorate through these categories as their recoverability weakens, with provisioning requirements rising at each stage.

Q2. The UNSECURED portion of a Doubtful Asset requires provisioning of:

- A. 10% only
- B. 100%, in full, regardless of how long it has been doubtful
- C. 0%, since it's unsecured
- D. Exactly the same rate as the secured portion

Answer: B

Since there is no collateral backing, the unsecured portion of a doubtful asset must be fully (100%) provided for.

Q3. A Loss Asset, once identified, requires provisioning of:

- A. 0%
- B. 10%
- C. 50%
- D. 100% (fully written off or fully provided)

Answer: D

Loss assets are considered uncollectible and must be either written off entirely or fully provided for.

Q4. CRAR is calculated as:

- A. $(\text{Tier I} + \text{Tier II Capital}) / \text{Total Risk-Weighted Assets} \times 100$
- B. $\text{Total Assets} / \text{Total Liabilities}$
- C. $\text{Net Profit} / \text{Total Capital}$
- D. $\text{Total Deposits} / \text{Total Loans}$

Answer: A

CRAR measures the adequacy of an NBFC's capital (Tier I + Tier II) relative to its risk-weighted exposure.

Q5. When RBI's prescribed regulatory provisioning norm is HIGHER than the Ind AS 109 ECL-based provision, an NBFC must:

- A. Use only the lower ECL provision and ignore RBI norms
- B. Maintain the higher regulatory provision, transferring the difference to an Impairment Reserve
- C. Ignore both requirements entirely
- D. Report negative provisions

Answer: B

NBFCs must comply with the more conservative (higher) of the two requirements, maintaining an Impairment Reserve for any shortfall in ECL relative to RBI norms.

Q6. A declining CRAR trend over successive periods is a signal that:

- A. The NBFC's capital buffer is strengthening relative to its risk exposure
- B. The NBFC's capital buffer is weakening relative to its risk-weighted exposure — an early warning sign
- C. The NBFC has no loans outstanding
- D. CRAR has no relevance to NBFC solvency

Answer: B

A falling CRAR indicates capital is not keeping pace with risk-weighted assets, a warning sign regulators monitor closely.

Q7. Standard Assets in an NBFC's portfolio typically require provisioning of approximately:

- A. 0.25%–0.40% (a relatively small percentage, reflecting low risk)
- B. 50%
- C. 75%
- D. 100%

Answer: A

Standard assets carry minimal credit risk, so provisioning rates are correspondingly low compared to sub-standard/doubtful/loss categories.

Q8. If a Sub-Standard Asset outstanding is ₹40 lakh and the prescribed provisioning rate is 10%, the provision required is:

- A. ₹2 lakh
- B. ₹4 lakh
- C. ₹8 lakh
- D. ₹40 lakh

Answer: B

Provision = 40 lakh $\times$ 10% = ₹4 lakh.

Q9. The graduated provisioning rates (e.g., 20%/30%/50%) for Doubtful Assets typically apply to:

- A. The unsecured portion only
- B. The SECURED portion, based on how long the asset has remained doubtful
- C. Neither the secured nor unsecured portion
- D. Only Standard Assets

Answer: B

The secured portion of a doubtful asset attracts graduated rates that increase the longer the asset remains doubtful; the unsecured portion is separately provided at 100%.

Q10. Why is under-provisioning by an NBFC a serious concern for financial reporting quality?

- A. It has no impact on reported profit or net worth

- B. It can materially overstate reported profit and net worth, masking the true credit risk in the loan book
- C. It only affects the cash flow statement
- D. It automatically improves the NBFC's credit rating

Answer: B

Insufficient provisioning understates expected losses, artificially inflating reported profitability and capital position — a key audit and regulatory concern.

Q11. Tier I Capital, for CRAR purposes, generally represents:

- A. The NBFC's total loan book
- B. Core capital — primarily equity capital and disclosed reserves, considered the highest-quality capital
- C. Only short-term deposits
- D. Contingent liabilities

Answer: B

Tier I is the core, highest-quality capital (equity and free reserves) able to absorb losses on an ongoing basis.

Q12. RBI's provisioning and CRAR norms for NBFCs are periodically revised primarily to:

- A. Remain permanently fixed and never change
- B. Reflect evolving risk assessment and maintain financial system stability
- C. Increase NBFC profits artificially
- D. Eliminate all regulatory oversight of NBFCs

Answer: B

Prudential norms are updated periodically by RBI to reflect the current risk environment and safeguard the stability of the financial system.

Q13. For exam purposes, provisioning rates and asset classification periods for NBFCs should be:

- A. Assumed to never change from any textbook example
- B. Verified against the CURRENT applicable RBI Master Direction, as these rates are periodically revised
- C. Irrelevant to CFR exam questions
- D. Always identical to banking sector norms

Answer: B

Since RBI periodically updates these norms, students should verify current applicable rates rather than relying on potentially outdated figures.

Q14. An asset classified as "doubtful" for MORE than a specified extended period (as per RBI norms) will attract:

- A. A LOWER provisioning rate than when it was first classified doubtful
- B. A HIGHER (graduated) provisioning rate on the secured portion, reflecting increasing doubt about recovery
- C. No provisioning at all
- D. Automatic reclassification as a Standard Asset

Answer: B

The longer an asset remains doubtful, the higher the prescribed provisioning rate on its secured portion, reflecting diminishing prospects of recovery over time.

Q15. NBFCs became subject to Ind AS-based financial reporting requirements starting from:

- A. A phased implementation date specified by MCA/RBI (in a manner similar to other Ind AS roadmap phases)
- B. NBFCs have never been required to follow Ind AS
- C. From the very first year of Ind AS introduction in India, with no phasing
- D. Only after complete privatisation of all NBFCs

Answer: A

Like other sectors, NBFCs were brought under Ind AS through a phased roadmap notified by the regulators, rather than all at once.

SECTION C

Business Combinations & Restructuring

Weightage: 20% of total marks | Module 5

Accounting for Business Combinations & Restructuring (Ind AS 103)

The acquisition method under Ind AS 103 — purchase consideration, goodwill/bargain purchase, non-controlling interest measurement, and business combinations under common control.

1. Formulas

Purchase Consideration (Fair Value of Consideration Transferred)

Purchase Consideration = Fair Value of Cash Paid + Fair Value of Equity Instruments Issued + Fair Value of Contingent Consideration (at acquisition date)

Acquisition-related costs (legal, advisory fees) are EXPENSED as incurred — they are NOT included in the purchase consideration or added to goodwill.

Goodwill on Acquisition

Goodwill = Purchase Consideration + Fair Value of Non-Controlling Interest (NCI) – Fair Value of Identifiable Net Assets Acquired

If the result is negative, it is NOT "negative goodwill" but a "Gain on Bargain Purchase," recognised directly in Profit or Loss on the acquisition date.

Non-Controlling Interest (NCI) — Two Measurement Options

Option 1 (Proportionate Method): $NCI = NCI\% \times \text{Fair Value of Identifiable Net Assets Acquired}$

Option 2 (Fair Value / "Full Goodwill" Method): $NCI = \text{Fair Value of NCI's Shareholding (often based on quoted price or a valuation)}$

The choice is made on an acquisition-by-acquisition basis. The Fair Value method results in HIGHER total goodwill being recognised (since it includes goodwill attributable to the NCI too).

Fair Value of Identifiable Net Assets Acquired

FV of Identifiable Net Assets = FV of Identifiable Assets Acquired (including newly recognised intangibles) – FV of Liabilities Assumed (including contingent liabilities meeting recognition criteria)

Assets/liabilities are recognised and measured at their acquisition-date FAIR VALUES, not the acquiree's previous book values — this often surfaces intangibles (brands, customer lists) not previously recognised on the acquiree's own books.

Step Acquisition (Business Combination Achieved in Stages)

Goodwill = [Fair Value of Previously-Held Equity Interest (remeasured) + Fair Value of New Consideration Paid + FV of NCI] – FV of Identifiable Net Assets

Any previously held equity interest is REMEASURED to fair value at the date control is obtained, with the resulting gain/loss recognised in P&L.

2. Practical Application

Acquisition-related costs — a common exam trap: Legal fees, due diligence costs, and advisory fees related to the acquisition are expensed in P&L as incurred — they must NOT be added to the purchase consideration or capitalised into goodwill, unlike costs of issuing debt/equity instruments (which follow their respective standards).

Choosing the NCI measurement option: The Fair Value (full goodwill) method is more common when NCI shares are actively traded (giving a reliable fair value) or when a "full" picture of total goodwill (including NCI's share) is desired for reporting purposes; the Proportionate method is simpler and often used for wholly-owned or near-wholly-owned subsidiaries.

Business Combinations under Common Control (Appendix C, Ind AS 103): These are SCOPED OUT of the standard acquisition method — instead, the "pooling of interests" method is typically applied (assets/liabilities recorded at existing book values, no new goodwill recognised), since these are essentially internal group reorganisations, not third-party acquisitions.

3. Worked Illustration

Illustration 5.1 — Goodwill on Acquisition (Proportionate NCI Method)

Acquirer purchases 80% of Target for a Purchase Consideration of ₹90,00,000. Target's identifiable net assets at fair value on the acquisition date = ₹1,00,00,000. NCI is measured using the Proportionate Method.

How to Read This Problem: A business combination question giving purchase consideration, an NCI measurement basis, and the fair value of identifiable net assets acquired — this tests the full goodwill formula with all three components, and the sign of the final result (goodwill vs bargain purchase) is part of the answer.

Solution Approach: Compute NCI first if using the proportionate method (a percentage of net assets), then add Purchase Consideration and NCI together and subtract Fair Value of Net Assets in one final step. If the result is negative, explicitly relabel it as a Gain on Bargain Purchase rather than 'negative goodwill' — that terminology distinction often carries marks.

STEP-BY-STEP SOLUTION

Step 1 — NCI (Proportionate Method): $\text{NCI} = 20\% \times 1,00,00,000 = \text{₹}20,00,000$

Step 2 — Apply the Goodwill formula: $\text{Goodwill} = \text{Purchase Consideration} + \text{NCI} - \text{FV of Identifiable Net Assets}$
 $= 90,00,000 + 20,00,000 - 1,00,00,000$

Step 3 — Compute Goodwill: $= 1,10,00,000 - 1,00,00,000 = \text{₹}10,00,000$

Interpretation: Goodwill of ₹10,00,000 is recognised on consolidation, representing the excess the Acquirer paid (proportionately, for its 80% stake) over its share of the fair value of Target's identifiable net assets.

4. Practice MCQs (15 × 2 Marks)

Q1. Under Ind AS 103, acquisition-related costs (legal fees, due diligence costs) should be:

- A. Added to the purchase consideration
- B. Expensed in Profit or Loss as incurred
- C. Capitalised as part of goodwill
- D. Deducted from the Non-Controlling Interest

Answer: B

Ind AS 103 specifically requires acquisition-related costs to be expensed as incurred, not included in the consideration or goodwill calculation.

Q2. If the Fair Value of Identifiable Net Assets Acquired exceeds Purchase Consideration plus NCI, the result is:

- A. Goodwill, recognised as an intangible asset
- B. A Gain on Bargain Purchase, recognised in Profit or Loss
- C. A reduction in share capital
- D. Negative Retained Earnings

Answer: B

A negative "goodwill" result under Ind AS 103 is termed a Gain on Bargain Purchase and taken directly to P&L, not capitalised as an asset.

Q3. Under the Fair Value (full goodwill) method of measuring NCI, compared to the Proportionate method, total Goodwill recognised will generally be:

- A. Lower
- B. Higher, since it includes goodwill attributable to the NCI's share as well
- C. Exactly the same
- D. Always zero

Answer: B

The Fair Value method captures goodwill attributable to BOTH the controlling and non-controlling interests, resulting in higher total goodwill than the Proportionate method.

Q4. In a step acquisition, any equity interest previously held by the Acquirer before obtaining control is:

- A. Ignored entirely
- B. Remeasured to fair value at the date control is obtained, with the gain/loss recognised in P&L
- C. Kept at its original historical cost
- D. Automatically written off to zero

Answer: B

Step acquisitions require the previously-held stake to be remeasured to fair value at the control date, recognising any resulting gain or loss in profit or loss.

Q5. Business Combinations under Common Control (Appendix C, Ind AS 103) are typically accounted for using:

- A. The standard acquisition method, with full fair valuation and new goodwill
- B. The "pooling of interests" method, using existing book values with no new goodwill
- C. Liquidation accounting
- D. No accounting entries at all

Answer: B

Since common control transactions are essentially internal reorganisations (not genuine third-party acquisitions), pooling of interests (book value) accounting is applied instead of the acquisition method.

Q6. Identifiable assets acquired in a business combination are measured at:

- A. The acquiree's original historical cost
- B. Their acquisition-date fair values
- C. Zero
- D. Book value as per the acquiree's last audited financial statements, unadjusted

Answer: B

Ind AS 103 requires identifiable assets and liabilities to be measured at their fair values as of the acquisition date, not at historical book values.

Q7. If Purchase Consideration = ₹60,00,000, NCI (Proportionate) = ₹15,00,000, and Fair Value of Identifiable Net Assets = ₹70,00,000, Goodwill/Bargain Purchase is:

- A. Goodwill of ₹5,00,000
- B. Gain on Bargain Purchase of ₹5,00,000
- C. Goodwill of ₹10,00,000
- D. No goodwill or bargain purchase gain

Answer: B

$60,00,000 + 15,00,000 - 70,00,000 = 5,00,000$ (negative goodwill), recognised as a ₹5,00,000 Gain on Bargain Purchase in P&L.

Q8. Contingent consideration in a business combination is measured, at the acquisition date, at:

- A. Zero, since it is uncertain
- B. Its fair value at the acquisition date
- C. Its maximum possible future payout, undiscounted
- D. Its minimum possible future payout only

Answer: B

Even though contingent, the consideration is measured and included in the purchase price at its acquisition-date fair value, based on the probability-weighted likely outcomes.

Q9. The choice between the Proportionate Method and the Fair Value Method for measuring NCI is made:

- A. Once, for the entity as a whole, applying to all future acquisitions
- B. On an acquisition-by-acquisition basis
- C. Only by the acquiree, never the acquirer
- D. It is not a choice; only one method is permitted

Answer: B

Ind AS 103 permits the entity to choose either method separately for each individual business combination transaction.

Q10. Under Ind AS 103, newly recognised intangible assets (e.g., a customer list not previously on the acquiree's books) arise because:

- A. Fair value measurement at acquisition can identify and value intangibles the acquiree never recognised under its own accounting policies
- B. All intangibles must always be assigned a value of zero
- C. Only tangible assets can ever be recognised in a business combination
- D. Intangibles are always ignored in a business combination

Answer: A

The acquisition method's fair value focus often surfaces internally-generated intangibles (which the acquiree couldn't recognise under its own accounting rules) as separately identifiable assets.

Q11. If an Acquirer sells part of its holding in a Subsidiary but RETAINS control, this is accounted for as:

- A. A disposal resulting in a gain/loss in P&L, similar to selling any other asset
- B. An equity transaction between owners (adjusting NCI and equity), with no gain/loss in P&L
- C. A full deconsolidation of the subsidiary
- D. Recognition of new goodwill

Answer: B

Since control is retained, this is treated purely as a transaction between owners (adjusting the NCI and parent's equity), not as a disposal generating a P&L gain/loss.

Q12. If a Parent sells its ENTIRE holding in a Subsidiary, resulting in LOSS of control, this is accounted for by:

- A. Continuing to consolidate the subsidiary as before
- B. Derecognising the subsidiary's assets/liabilities/NCI and recognising a gain/loss on disposal in P&L
- C. Ignoring the transaction entirely
- D. Treating it as a pure equity transaction with no P&L impact

Answer: B

Loss of control triggers full derecognition of the subsidiary's net assets and NCI, with any resulting difference (compared to consideration received plus fair value of any retained interest) recognised as a gain/loss in P&L.

Q13. Under Ind AS 103, the "acquisition date" is defined as:

- A. The date the acquirer first expressed interest in the target
- B. The date the acquirer obtains control of the acquiree
- C. The date the deal is publicly announced in the media
- D. The date the acquiree's financial year ends

Answer: B

The acquisition date — when control is legally/effectively obtained — is the reference date for measuring fair values and calculating goodwill.

Q14. A key difference between Ind AS 103 and the old AS 14 (Accounting for Amalgamations) is that Ind AS 103:

- A. Uses only book values, never fair values
- B. Consistently applies the acquisition method with fair valuation of identifiable net assets, unlike AS 14's pooling-of-interest option for certain amalgamations
- C. Prohibits any goodwill recognition whatsoever
- D. Applies only to government entities

Answer: B

Ind AS 103 mandates the acquisition (fair value) method for most business combinations, a significant shift from AS 14's broader use of pooling-of-interests for certain amalgamation types.

Q15. Goodwill recognised on a business combination is subsequently:

- A. Amortised over a fixed useful life, like other intangibles
- B. Tested annually for impairment, and NOT amortised, under Ind AS
- C. Written off immediately in full at the end of the acquisition year
- D. Revalued upward every year automatically

Answer: B

Under Ind AS (consistent with Ind AS 36), goodwill is not amortised but is subject to mandatory annual impairment testing.

SECTION D

Consolidated & Separate Financial Statements

Weightage: 20% of total marks | Module 6

Consolidated & Separate Financial Statements (Ind AS 110, 111, 28, 27)

Consolidation mechanics for subsidiaries (Ind AS 110), joint arrangements (Ind AS 111), the equity method for associates (Ind AS 28), and separate financial statements (Ind AS 27).

1. Formulas

Goodwill on Consolidation (at acquisition)

Goodwill = Cost of Investment (by Parent) + Fair Value of NCI – Parent's Share of Fair Value of Subsidiary's Identifiable Net Assets at Acquisition

This is computed once, at the date the Parent acquires control, and (subject to impairment) carried forward in the Consolidated Balance Sheet.

Non-Controlling Interest (NCI) — at Reporting Date

NCI (at reporting date) = NCI's Share of Subsidiary's Net Assets at Acquisition + NCI's Share of Subsidiary's Post-Acquisition Profits (or Losses) – NCI's Share of any Dividends Paid by Subsidiary

NCI is presented within Equity in the Consolidated Balance Sheet, separately from the Parent's own equity.

Consolidated Retained Earnings / Reserves

Consolidated Reserves = Parent's Own Reserves + Parent's Share of Subsidiary's Post-Acquisition Profits – Unrealised Profit on Intra-Group Transactions (to the extent of Parent's holding) – Consolidation Adjustments (e.g., additional depreciation on fair value uplift)

Only POST-acquisition profits of the subsidiary are added; PRE-acquisition profits form part of the goodwill calculation, not consolidated reserves.

Unrealised Profit on Intra-Group (Inventory) Transactions

Unrealised Profit = Closing Inventory (at transfer price) × [Profit Margin / (100 + Profit Margin)] (if margin is on cost) OR × Profit Margin % (if margin is on selling price)

This unrealised profit must be eliminated from both consolidated inventory (asset) and consolidated reserves, since the group hasn't sold the goods to an outside party yet.

Equity Method — Associates (Ind AS 28)

Carrying Amount of Investment = Cost of Investment + Investor's Share of Post-Acquisition Profit/Loss of Associate – Dividends Received from Associate

Unlike full consolidation (line-by-line), the equity method shows the investment as a SINGLE LINE in the Investor's balance sheet, adjusted each period for its share of the associate's results.

Joint Venture — Ind AS 111 (Equity Method)

Same mechanics as the Equity Method for Associates: Carrying Amount = Cost + Share of Post-Acquisition Profit/Loss – Dividends Received

Ind AS 111 requires JOINT VENTURES to use the equity method (unlike some older GAAPs which permitted proportionate consolidation) — only a "Joint Operation" (not a Joint Venture) uses direct proportionate recognition of assets/liabilities/income/expenses.

2. Practical Application

Full consolidation vs equity method — the key distinction: A Subsidiary (control, generally >50% voting power or otherwise controlled) is fully consolidated line-by-line; an Associate (significant influence, typically 20-50%) uses the equity method (single-line investment); a Joint Venture (joint control) also uses the equity method under Ind AS 111.

Why unrealised profit elimination matters: If a Parent sells goods to its Subsidiary at a profit, and the Subsidiary hasn't yet sold those goods outside the group, the group as a WHOLE hasn't earned that profit yet — failing to eliminate it would overstate consolidated profit and inventory.

Uniform accounting policies: Ind AS 110 requires the Parent to adjust the Subsidiary's financial statements to align with the Group's accounting policies BEFORE consolidation, if the Subsidiary uses different policies for similar transactions — a frequently tested adjustment.

3. Worked Illustrations

Illustration 6.1 — Goodwill & NCI on Consolidation

Parent acquires 75% of Subsidiary for ₹45,00,000 on 1 April. At that date, Subsidiary's identifiable net assets (fair value) = ₹50,00,000. NCI is measured at its proportionate share of net assets. By the reporting date, Subsidiary has earned post-acquisition profit of ₹8,00,000 (no dividends paid).

How to Read This Problem: A consolidation question giving acquisition-date figures (cost of investment, fair value of net assets) AND post-acquisition profit for the year — recognise this needs THREE separate consolidation figures (Goodwill, NCI at reporting date, and Parent's share added to consolidated reserves), not just one.

Solution Approach: Compute Goodwill at acquisition first (a one-time, historical calculation). Then separately roll NCI forward from its acquisition-date value by adding NCI's share of post-acquisition profit. Finally, compute the Parent's OWN share of post-acquisition profit as the amount added to consolidated reserves — these three figures use the SAME post-acquisition profit but in different proportions (NCI% vs Parent%), so keep them clearly distinct.

STEP-BY-STEP SOLUTION

Step 1 — NCI at Acquisition (Proportionate): $25\% \times 50,00,000 = ₹12,50,000$

Step 2 — Goodwill: Cost of Investment + NCI – FV of Net Assets = $45,00,000 + 12,50,000 - 50,00,000 = ₹7,50,000$

Step 3 — NCI's share of post-acquisition profit: $25\% \times 8,00,000 = ₹2,00,000$

Step 4 — NCI at Reporting Date: $12,50,000 + 2,00,000 = ₹14,50,000$

Step 5 — Parent's share of post-acquisition profit added to Consolidated Reserves: $75\% \times 8,00,000 = ₹6,00,000$ (added to Parent's own reserves in the Consolidated Balance Sheet)

Interpretation: Goodwill of ₹7,50,000 is carried in the Consolidated Balance Sheet (subject to impairment testing); NCI is presented within equity at ₹14,50,000, having grown from its initial ₹12,50,000 by its 25% share of the Subsidiary's post-acquisition profits.

Illustration 6.2 — Unrealised Profit on Intra-Group Inventory

Parent sold goods to its Subsidiary during the year at a price of ₹12,00,000, including a profit margin of 20% on cost. At the reporting date, the Subsidiary still holds 25% of these goods in its closing inventory.

How to Read This Problem: An intra-group unrealised profit question giving a sale amount, a profit margin basis (on cost or on selling price), and the fraction of goods still held in closing inventory — the margin basis (cost vs selling price) changes the fraction you apply, a frequent source of error.

Solution Approach: First isolate the portion of the transferred goods STILL held in inventory (a fraction of the total transfer price). Then apply the correct margin fraction: if margin is on COST, use $\text{margin}/(100+\text{margin})$; if margin is on SELLING PRICE, use the margin percentage directly. This unrealised profit is then removed from both consolidated inventory and consolidated reserves.

STEP-BY-STEP SOLUTION

Step 1 — Closing inventory (at transfer price) still held: $25\% \times 12,00,000 = ₹3,00,000$

Step 2 — Unrealised profit margin (20% on cost, so profit = 20/120 of the transfer price): $3,00,000 \times (20/120) = ₹50,000$

Interpretation: ₹50,000 of unrealised profit must be eliminated: reduce Consolidated Inventory by ₹50,000 and reduce Consolidated Reserves (Parent's share, since Parent made the sale) by ₹50,000 — the group has not yet earned this profit as the goods remain unsold outside the group.

4. Practice MCQs (15 × 2 Marks)

Q1. Under Ind AS 28, an Associate is defined as an entity over which the investor has:

- A. Control
- B. Significant influence (typically 20%-50% voting power), but not control
- C. No relationship at all
- D. Joint control shared equally with one other party

Answer: B

Significant influence (the ability to participate in financial/operating policy decisions, without controlling those policies) characterises an Associate relationship.

Q2. Under Ind AS 111, a Joint Venture is accounted for using:

- A. Full line-by-line consolidation, as with a subsidiary
- B. The Equity Method
- C. Proportionate consolidation of assets/liabilities
- D. No accounting recognition at all

Answer: B

Ind AS 111 mandates the equity method for Joint Ventures, a departure from proportionate consolidation permitted under some earlier GAAPs.

Q3. Pre-acquisition profits of a subsidiary are:

- A. Added to Consolidated Reserves in full
- B. Factored into the Goodwill calculation (as part of net assets at acquisition), NOT added to consolidated reserves
- C. Ignored entirely
- D. Distributed as dividends automatically

Answer: B

Since pre-acquisition profits form part of the subsidiary's net assets AT acquisition, they factor into the goodwill computation, not into post-acquisition consolidated reserves.

Q4. Unrealised profit on intra-group inventory transactions must be eliminated because:

- A. The group as a whole has not yet earned that profit from an external party
- B. Tax authorities require it
- C. It has no impact on the consolidated financial statements
- D. It only affects the subsidiary's separate financial statements

Answer: A

From the group's perspective, profit is only realised when goods are sold outside the group — unrealised intra-group profit must be eliminated on consolidation.

Q5. Under the Equity Method (Ind AS 28), the Investor's Balance Sheet shows the investment in the Associate as:

- A. A line-by-line breakdown of all the associate's assets and liabilities
- B. A single-line item, adjusted periodically for the investor's share of the associate's profit/loss
- C. At original cost only, never adjusted
- D. As a current liability

Answer: B

Unlike full consolidation, the equity method shows the investment as one line, with its carrying amount adjusted for the investor's share of the associate's subsequent results.

Q6. Non-Controlling Interest (NCI) is presented in the Consolidated Balance Sheet as:

- A. A liability
- B. A separate component within Equity

- C. A contra-asset
- D. It is not presented anywhere

Answer: B

Ind AS 110 requires NCI to be presented within equity, separately from the equity attributable to the Parent's owners.

Q7. Ind AS 110 requires the Parent to adjust a Subsidiary's financial statements, prior to consolidation, when:

- A. The Subsidiary is 100% owned
- B. The Subsidiary uses different accounting policies from the Group for similar transactions
- C. The Subsidiary is located in the same city as the Parent
- D. Never — no adjustments are ever required

Answer: B

Consolidation requires uniform group accounting policies; if the subsidiary's policies differ, adjustments must be made before consolidating.

Q8. A "Joint Operation" (as distinct from a "Joint Venture") under Ind AS 111 is accounted for by each operator recognising:

- A. A single-line equity-method investment
- B. Its own share of the assets, liabilities, revenues, and expenses of the joint operation directly (proportionate recognition)
- C. Nothing at all
- D. Full consolidation of the entire joint operation

Answer: B

Unlike a Joint Venture (equity method), a Joint Operator directly recognises its own proportionate share of the underlying assets, liabilities, revenues, and expenses.

Q9. If Cost of Investment = ₹30,00,000, NCI (proportionate) = ₹10,00,000, and FV of Subsidiary's Net Assets at acquisition = ₹35,00,000, Goodwill is:

- A. ₹5,00,000
- B. ₹10,00,000
- C. ₹15,00,000
- D. Nil, since it's a bargain purchase of ₹5,00,000

Answer: A

Goodwill = 30,00,000 + 10,00,000 – 35,00,000 = ₹5,00,000 (positive, so it IS goodwill, not a bargain purchase).

Q10. Ind AS 27 primarily governs:

- A. Consolidated Financial Statements only
- B. Separate Financial Statements of a Parent, Investor, or Venturer, prepared IN ADDITION to consolidated statements
- C. Government Accounting
- D. Segment reporting

Answer: B

Ind AS 27 sets out the accounting requirements for an entity's own Separate Financial Statements, where investments in subsidiaries/associates/JVs are accounted for at cost, in accordance with Ind AS 109, or using the equity method.

Q11. If a Subsidiary pays a dividend during the year, the Parent's Consolidated Reserves are affected by:

- A. Adding the full dividend amount to consolidated reserves
- B. Eliminating the intra-group dividend received by the Parent (since it's an internal group transaction), and reducing NCI for its share of the dividend paid
- C. No effect at all on consolidation
- D. Doubling the dividend for consolidation purposes

Answer: B

Dividends paid by a subsidiary to its parent are intra-group transactions eliminated on consolidation; the NCI's share of the dividend reduces the NCI balance.

Q12. Significant Influence, for the purposes of Ind AS 28, is generally PRESUMED to exist when the investor holds:

- A. Less than 5% of voting power
- B. 20% or more of the voting power of the investee
- C. Exactly 100% of voting power

D. No voting rights at all

Answer: B

A holding of 20% or more of voting power creates a rebuttable presumption of significant influence under Ind AS 28.

Q13. If an associate reports a LOSS for the year, the investor's Equity Method carrying amount of the investment is:

- A. Increased by the investor's share of the loss
- B. Decreased by the investor's share of the loss
- C. Unaffected by the associate's results
- D. Automatically written off to zero regardless of the loss amount

Answer: B

The equity method decreases the carrying amount of the investment by the investor's proportionate share of any losses reported by the associate.

Q14. Which of the following relationships would typically require FULL CONSOLIDATION under Ind AS 110?

- A. A 15% shareholding with no board representation or other influence
- B. A 65% shareholding giving the investor control over the investee's relevant activities
- C. A 30% shareholding with significant influence but no control
- D. A 50:50 joint venture with joint control

Answer: B

A majority shareholding giving control (the power to direct relevant activities and exposure to variable returns) triggers full consolidation as a subsidiary under Ind AS 110.

Q15. In the equity method, if the investor's cumulative share of an associate's losses exceeds the carrying amount of the investment, the investor generally:

- A. Continues recognising further losses, creating a negative investment balance with no limit
- B. Discontinues recognising further losses once the investment carrying amount reaches zero (unless it has incurred obligations or made payments on the associate's behalf)
- C. Immediately consolidates the associate as a subsidiary instead
- D. Reverses all previously recognised losses

Answer: B

Under the equity method, the investment carrying amount is generally not reduced below zero from recognising further losses, unless the investor has a legal/constructive obligation to fund the associate's losses.

SECTION E

Recent Developments in Financial Reporting

Weightage: 10% of total marks | Module 7

Recent Developments in Financial Reporting

Largely conceptual — Sustainability/ESG Reporting, Integrated Reporting, Fair Value Measurement (Ind AS 113), XBRL, and evolving corporate reporting trends beyond traditional financial statements.

1. Key Concepts & Applicable Formula

Concept	Exam-Relevant Point
Integrated Reporting (IR)	Combines financial and non-financial information (the "Six Capitals": Financial, Manufactured, Intellectual, Human, Social & Relationship, Natural) into a single concise report showing how the organisation creates value over time.
Sustainability Reporting	Discloses an entity's Environmental, Social, and Governance (ESG) performance — often following frameworks like GRI (Global Reporting Initiative) or, in India, the mandated Business Responsibility and Sustainability Report (BRSR) for top listed companies.
Triple Bottom Line (TBL) Reporting	Evaluates performance across three dimensions: People (social), Planet (environmental), and Profit (financial) — moving beyond purely financial profit as the sole success measure.
Corporate Social Responsibility (CSR) Reporting	Under the Companies Act, 2013, specified companies must spend at least 2% of average net profits (of the preceding 3 financial years) on CSR activities and report on it.
Fair Value Measurement (Ind AS 113)	Establishes a single framework for fair value measurement, including the 3-level Fair Value Hierarchy (Level 1: quoted prices; Level 2: observable inputs other than quoted prices; Level 3: unobservable inputs).
XBRL (eXtensible Business Reporting Language)	A structured, machine-readable digital "tagging" language for financial reporting, mandated by MCA for specified classes of companies filing with the Registrar of Companies — enables faster, more consistent data analysis by regulators/analysts.
Business Responsibility Reporting	Disclosure of a company's initiatives on environmental, social, and governance fronts, now largely superseded/expanded by the more detailed BRSR framework for top listed entities in India.

CSR Spend Requirement (Companies Act, 2013, Section 135)

Minimum CSR Spend = 2% × Average Net Profit of the company during the 3 immediately preceding financial years

Applies to companies meeting specified thresholds of net worth, turnover, or net profit — any shortfall (beyond specified exceptions) must be transferred to a specified fund or an "Unspent CSR Account."

2. Practical Application

Why non-financial reporting matters increasingly: Investors, lenders, and regulators increasingly assess ESG/sustainability performance as a proxy for long-term risk and resilience — a company's non-financial disclosures can now materially influence its cost of capital and investor base (e.g., ESG-focused funds).

Fair Value Hierarchy and its exam relevance: Understanding WHICH level (1, 2, or 3) applies to a given asset/liability is frequently tested — e.g., actively traded equity shares (Level 1), most bonds valued using observable market yield curves (Level 2), and an early-stage startup investment valued using unobservable internal projections (Level 3).

XBRL's practical benefit: By tagging every financial statement line item with a standardised, machine-readable identifier, XBRL enables regulators to instantly compare and analyse filings across thousands of companies — a significant improvement over manually extracting data from PDF-format financial statements.

3. Illustrative Scenario

Illustration 7.1 — CSR Spend & Fair Value Hierarchy Classification

(a) A company's average net profit for the preceding 3 years is ₹40,00,00,000. (b) The company holds: (i) shares of a company listed on the NSE, (ii) a corporate bond valued using an observable market yield curve, and (iii) an investment in an unlisted early-stage startup valued using the company's own unobservable cash flow projections.

How to Read This Problem: A combined CSR-spend-and-fair-value-hierarchy question testing two unrelated 'recent developments' concepts in one scenario — treat this explicitly as two separate mini-questions requiring two separate answers.

Solution Approach: Calculate the CSR spend requirement first as a simple percentage-of-profit calculation. Then, for each investment described, ask 'is there a direct quoted market price (Level 1), an observable but indirect input like a yield curve (Level 2), or only internal/unobservable assumptions (Level 3)?' and classify each one independently.

STEP-BY-STEP SOLUTION

Step 1 — CSR Spend Requirement: $2\% \times 40,00,00,000 = \text{₹}80,00,000$ minimum required CSR spend for the year

Step 2 — Classify each investment in the Fair Value Hierarchy:

- (i) NSE-listed shares → **Level 1** (quoted price in an active market)
- (ii) Corporate bond (market yield curve) → **Level 2** (observable inputs, not a direct quoted price)
- (iii) Unlisted startup (internal projections) → **Level 3** (unobservable inputs)

Interpretation: The company must spend at least ₹80,00,000 on CSR activities for the year, and must disclose its three investments applying the appropriate fair value hierarchy level to each — reflecting the differing degree of market observability behind each valuation.

4. Practice MCQs (15 × 2 Marks)

Q1. Integrated Reporting (IR) is built around the concept of:

- A. Reporting only financial capital
- B. The "Six Capitals" (Financial, Manufactured, Intellectual, Human, Social & Relationship, and Natural) showing how value is created over time
- C. Reporting exclusively on tax compliance
- D. Only reporting employee headcount

Answer: B

Integrated Reporting's central framework is the Six Capitals model, illustrating a holistic view of how an organisation creates and preserves value.

Q2. Under Section 135 of the Companies Act, 2013, the minimum CSR spend requirement for qualifying companies is:

- A. 1% of average net profit of the preceding 3 years
- B. 2% of average net profit of the preceding 3 years
- C. 5% of average net profit of the preceding 3 years
- D. 10% of current year's net profit

Answer: B

Section 135 mandates a minimum 2% of the average net profit of the three immediately preceding financial years to be spent on CSR.

Q3. Under the Ind AS 113 Fair Value Hierarchy, "Level 1" inputs are:

- A. Unobservable inputs based purely on management's own assumptions
- B. Quoted prices in active markets for identical assets or liabilities
- C. Observable inputs other than quoted prices
- D. There is no Level 1 in the hierarchy

Answer: B

Level 1 represents the highest-quality, most reliable fair value inputs — direct quoted prices in active markets.

Q4. Triple Bottom Line (TBL) reporting evaluates organisational performance across which three dimensions?

- A. Sales, Marketing, and Finance
- B. People, Planet, and Profit
- C. Assets, Liabilities, and Equity
- D. Revenue, Cost, and Tax

Answer: B

TBL expands the traditional profit-only view to include social (People) and environmental (Planet) performance alongside financial (Profit) results.

Q5. XBRL is best described as:

- A. A physical paper-based filing format
- B. A structured, machine-readable digital tagging language for financial reporting data
- C. A type of audit opinion
- D. A tax computation software

Answer: B

XBRL is a standardised digital language that "tags" each financial statement line item, enabling structured, machine-readable regulatory filings.

Q6. A corporate bond valued using an observable market yield curve (rather than a direct quoted price) would typically be classified under the Fair Value Hierarchy as:

- A. Level 1
- B. Level 2
- C. Level 3
- D. Outside the fair value hierarchy entirely

Answer: B

Since the valuation relies on OBSERVABLE inputs (a market yield curve) rather than a direct quote, it falls under Level 2 of the hierarchy.

Q7. An investment valued using an entity's own unobservable internal cash flow projections would be classified as:

- A. Level 1
- B. Level 2
- C. Level 3
- D. Not subject to fair value measurement at all

Answer: C

Level 3 applies when fair value must rely on unobservable inputs, such as an entity's own internal projections/assumptions.

Q8. In India, the Business Responsibility and Sustainability Report (BRSR) is mandated for:

- A. All companies, regardless of size or listing status
- B. The top listed companies (by market capitalisation), as specified by SEBI
- C. Only government-owned entities
- D. Only companies with no employees

Answer: B

SEBI has mandated BRSR reporting for the top listed companies by market capitalisation, as part of enhanced ESG disclosure requirements.

Q9. If a qualifying company's average net profit for the preceding 3 years is ₹25,00,00,000, its minimum CSR spend requirement is:

- A. ₹25,00,000
- B. ₹50,00,000
- C. ₹1,25,00,000
- D. ₹2,50,00,000

Answer: B

$2\% \times 25,00,00,000 = ₹50,00,000$.

Q10. Sustainability Reporting frameworks (e.g., GRI) primarily disclose:

- A. Only quarterly profit figures
- B. An entity's Environmental, Social, and Governance (ESG) performance

- C. Only the company's tax payments
- D. Only employee salary details

Answer: B

Sustainability reporting frameworks like GRI focus on comprehensive ESG performance disclosure, beyond pure financial metrics.

Q11. A key benefit of XBRL for regulators and analysts is that it:

- A. Makes financial data harder to compare across companies
- B. Enables fast, automated, and consistent extraction and comparison of financial data across many filings
- C. Eliminates the need for any financial statements at all
- D. Only works for a single company at a time, with no cross-company comparison possible

Answer: B

Standardised tagging allows automated tools to extract and compare data across thousands of company filings far more efficiently than manual review.

Q12. Integrated Reporting differs from traditional annual financial reporting mainly because it:

- A. Reports ONLY on financial capital, ignoring everything else
- B. Provides a concise, holistic view combining financial AND non-financial value drivers
- C. Is legally required to be identical to the financial statements
- D. Cannot be prepared by any listed company

Answer: B

Integrated Reporting aims for conciseness while capturing the full range of capitals/resources that drive an organisation's value creation, not just financial results.

Q13. Investors increasingly consider ESG/sustainability disclosures because they:

- A. Have no bearing on investment risk or returns
- B. Can serve as a proxy for long-term business risk and resilience, potentially affecting a company's cost of capital
- C. Are purely a public relations exercise with no financial relevance
- D. Are only relevant to government-owned companies

Answer: B

ESG performance is increasingly viewed by capital markets as material to long-term risk assessment, influencing investment decisions and cost of capital.

Q14. Unutilised/unspent CSR amounts (beyond specified exceptions), under the Companies Act framework, must be:

- A. Simply retained as free cash with no further obligation
- B. Transferred to a specified fund (e.g., a Schedule VII fund) or an "Unspent CSR Account," as prescribed
- C. Distributed to shareholders as a dividend
- D. Used to buy back company shares

Answer: B

The CSR framework requires unspent amounts (with limited exceptions for ongoing projects) to be transferred to prescribed funds or a designated Unspent CSR Account, ensuring compliance accountability.

Q15. The overarching theme connecting most "recent developments" in financial reporting (IR, sustainability reporting, XBRL) is:

- A. A move away from any form of disclosure entirely
- B. Expanding the scope, transparency, and usability of corporate reporting beyond traditional financial statements alone
- C. Reducing all reporting requirements to a single line item
- D. Eliminating audit requirements

Answer: B

These developments collectively reflect a broader trend toward richer, more transparent, and more usable/comparable corporate disclosure, going well beyond the traditional financial statement format alone.

SECTION F

Government Accounting in India

Weightage: 10% of total marks | Module 8

Government Accounting in India

Largely conceptual — the structure of government funds, the cash-basis system of government accounting, budgetary control, and the role of the Comptroller and Auditor General (CAG).

1. Key Concepts & Applicable Formula

Concept	Exam-Relevant Point
Consolidated Fund of India (CFI)	The principal government fund into which all revenues received and loans raised by the Government flow; all government expenditure is met from this fund, and withdrawals require Parliamentary authorisation (via an Appropriation Act).
Contingency Fund of India	A fund at the disposal of the President, used to meet unforeseen/urgent expenditure pending Parliamentary approval — amounts drawn are subsequently recouped from the Consolidated Fund once Parliament authorises the expenditure.
Public Account of India	Holds monies (e.g., provident fund balances, small savings) for which the Government acts merely as a banker/trustee — these do not belong to the Government and don't require Parliamentary appropriation for payments out.
Cash Basis of Accounting	Indian Government accounts are maintained substantially on a CASH basis (transactions recorded when cash is actually received/paid), unlike the accrual basis increasingly used in corporate/Ind AS reporting.
Appropriation Accounts	Compare actual expenditure (under each Grant/Appropriation) against the amounts authorised by Parliament through the Appropriation Act, highlighting excesses or savings.
Comptroller and Auditor General (CAG)	The constitutional authority (Article 148) responsible for auditing all receipts and expenditure of the Union and State Governments, ensuring accountability for public funds.
Finance Accounts	Present the complete financial position of the Government for the year, detailing receipts and disbursements across the Consolidated Fund, Contingency Fund, and Public Account.

Fiscal Deficit (Conceptual)

Fiscal Deficit = Total Expenditure – Total Receipts (Revenue Receipts + Non-Debt Capital Receipts, EXCLUDING borrowings)

Represents the government's total borrowing requirement for the year to bridge the gap between expenditure and non-borrowed receipts.

Revenue Deficit (Conceptual)

Revenue Deficit = Total Revenue Expenditure – Total Revenue Receipts

Indicates that the government's day-to-day operating expenses exceed its regular (non-capital) revenue — a sign of potential fiscal stress if persistent.

2. Practical Application

Cash vs Accrual — why this distinction matters for a CMA: Since government accounts are largely cash-based, they don't naturally capture accrued liabilities (e.g., pension obligations building up) or depreciation on government assets — this is a key limitation increasingly debated in public financial management reform discussions (a good exam discussion point).

Role of the Contingency Fund: The Contingency Fund allows the Government to meet genuinely URGENT, unforeseen expenditure WITHOUT waiting for prior Parliamentary approval — but the amount drawn must subsequently be recouped from the Consolidated Fund once Parliament sanctions the expenditure through a Supplementary Appropriation.

CAG's audit role vs statutory (company) audit: Unlike a statutory auditor's opinion on a private company's financial statements, the CAG's audit of government accounts focuses heavily on regularity (was spending properly authorised?), propriety (was it a wise use of public money?), and performance (did it achieve its intended objectives) — a broader mandate than typical financial statement audit.

3. Illustrative Scenario

Illustration 8.1 — Classifying Government Fund Transactions

Classify each of the following into the Consolidated Fund, Contingency Fund, or Public Account of India: (a) Income tax collections received by the Government; (b) An urgent, unforeseen disaster-relief expenditure sanctioned by the President pending Parliamentary approval; (c) Provident Fund contributions held on behalf of government employees.

How to Read This Problem: A government-accounting classification question describing several transactions in narrative form rather than giving numbers — this tests conceptual classification (which of the three government funds) rather than arithmetic.

Solution Approach: For each transaction, ask two questions in sequence: 'Does this money belong to the Government, or is the Government merely holding it in trust for someone else (→ Public Account)?' and if it belongs to Government, 'Is this routine/authorised spending (→ Consolidated Fund) or urgent/unforeseen spending pending approval (→ Contingency Fund)?'

STEP-BY-STEP SOLUTION

- (a) **Income tax collections:** These are regular government REVENUE receipts → form part of the **Consolidated Fund of India**
- (b) **Urgent disaster-relief expenditure (pending Parliamentary approval):** Drawn from the **Contingency Fund of India**, to be recouped from the Consolidated Fund once Parliament formally sanctions it
- (c) **Provident Fund contributions (Government as trustee):** These belong to the employees, not the Government → recorded in the **Public Account of India**

Interpretation: Each transaction is classified based on WHOSE money it fundamentally is and the URGENCY/authorisation status of the expenditure — a foundational distinction tested repeatedly in Government Accounting questions.

4. Practice MCQs (15 × 2 Marks)

Q1. All government revenue receipts and loans raised by the Government flow into the:

- A. Contingency Fund of India
- B. Consolidated Fund of India
- C. Public Account of India
- D. A private bank account of the Finance Minister

Answer: B

The Consolidated Fund of India is the principal fund receiving all government revenues and loan proceeds, from which most expenditure is authorised.

Q2. Withdrawal of money from the Consolidated Fund of India requires:

- A. No approval of any kind
- B. Parliamentary authorisation, typically via an Appropriation Act
- C. Only the Finance Minister's personal signature
- D. Approval from a private bank

Answer: B

Parliamentary sanction (through the Appropriation Act, following the Budget process) is constitutionally required before money can be withdrawn from the Consolidated Fund.

Q3. The Contingency Fund of India is used for:

- A. Routine, planned annual expenditure
- B. Urgent, unforeseen expenditure, pending subsequent Parliamentary approval
- C. Employee provident fund balances
- D. Foreign exchange reserves only

Answer: B

This fund exists specifically to enable the Government to respond to genuinely urgent, unforeseen needs without delay, with formal Parliamentary sanction following afterward.

Q4. Provident Fund balances of government employees are accounted for in the:

- A. Consolidated Fund of India
- B. Contingency Fund of India
- C. Public Account of India, since the Government acts merely as a banker/trustee for this money
- D. Not accounted for anywhere

Answer: C

Since these funds belong to the employees (not the Government), they sit in the Public Account, where the Government's role is custodial rather than as owner.

Q5. Indian Government accounts are maintained substantially on which basis of accounting?

- A. Full accrual basis, identical to Ind AS-compliant corporate accounts
- B. Cash basis — transactions recorded when cash is actually received or paid
- C. A hybrid basis identical to IFRS
- D. No consistent basis is followed

Answer: B

Indian government accounting remains substantially cash-based, a key distinction from the accrual-based corporate financial reporting covered elsewhere in this syllabus.

Q6. Appropriation Accounts compare:

- A. Only revenue receipts against expenditure
- B. Actual expenditure under each Grant against the amount authorised by Parliament
- C. Two different companies' balance sheets
- D. Import and export figures

Answer: B

Appropriation Accounts specifically track how actual spending compares to what Parliament sanctioned for each Grant/Appropriation, highlighting excesses or savings.

Q7. The Comptroller and Auditor General (CAG) of India derives authority from:

- A. A private company's Articles of Association
- B. Article 148 of the Constitution of India
- C. The Companies Act, 2013 only
- D. A State Government notification only

Answer: B

The CAG's constitutional mandate to audit government accounts is established under Article 148 of the Indian Constitution.

Q8. A key limitation of cash-based government accounting is that it:

- A. Perfectly captures all accrued future liabilities like pension obligations
- B. Does not naturally capture accrued liabilities or asset depreciation, unlike accrual accounting
- C. Requires no auditing at all
- D. Is identical to Ind AS in every respect

Answer: B

Since cash accounting only records actual cash flows, it misses non-cash items like accrued pension liabilities or depreciation — a recognised limitation prompting reform discussions.

Q9. Fiscal Deficit is calculated as:

- A. Total Revenue Receipts – Total Revenue Expenditure
- B. Total Expenditure – Total Receipts (excluding borrowings)
- C. Total Assets – Total Liabilities
- D. Capital Expenditure – Capital Receipts only

Answer: B

Fiscal Deficit measures the government's total borrowing requirement, being the gap between total expenditure and total non-borrowed receipts.

Q10. Revenue Deficit occurs when:

- A. Total Revenue Receipts exceed Total Revenue Expenditure
- B. Total Revenue Expenditure exceeds Total Revenue Receipts
- C. Capital receipts exceed capital expenditure
- D. There is no borrowing at all

Answer: B

A Revenue Deficit arises when day-to-day (revenue) expenditure exceeds regular (revenue) receipts, indicating the government is borrowing even to cover routine operating costs.

Q11. Amounts drawn from the Contingency Fund of India for urgent expenditure are subsequently:

- A. Written off permanently with no further action
- B. Recouped from the Consolidated Fund once Parliament grants formal (often supplementary) approval
- C. Charged directly to the Public Account
- D. Never repaid under any circumstances

Answer: B

The Contingency Fund is designed to be replenished — once Parliament sanctions the expenditure, an equivalent amount is transferred back from the Consolidated Fund.

Q12. The CAG's audit of government accounts, compared to a typical statutory company audit, has a BROADER mandate that also examines:

- A. Only whether the financial statements are mathematically accurate
- B. Regularity (proper authorisation), propriety (wise use of public money), and performance (achievement of objectives)
- C. Only tax computation accuracy
- D. Only the company's share price movement

Answer: B

CAG audits extend beyond financial accuracy to assess whether public expenditure was properly authorised, prudently used, and effective in achieving its stated goals.

Q13. Finance Accounts of the Government present the complete financial position covering:

- A. Only the Consolidated Fund
- B. Receipts and disbursements across the Consolidated Fund, Contingency Fund, and Public Account together
- C. Only private sector companies' accounts
- D. Only foreign exchange transactions

Answer: B

Finance Accounts provide a comprehensive view spanning all three government fund categories, not just the Consolidated Fund alone.

Q14. If a state disaster requires immediate, unbudgeted relief expenditure before Parliament can convene to approve it, the appropriate source of funds is:

- A. The Public Account, since it holds trust monies
- B. The Contingency Fund of India, specifically designed for such urgent, unforeseen situations
- C. A private bank loan taken by the Finance Minister personally
- D. No funding mechanism exists for such situations

Answer: B

This is precisely the scenario the Contingency Fund is designed for — urgent, unforeseen expenditure needs that cannot wait for prior Parliamentary sanction.

Q15. Ongoing public financial management reform discussions in India have increasingly explored moving toward:

- A. Abandoning all forms of government accounting entirely
- B. Greater elements of accrual-based accounting, to better capture the government's true financial position (including liabilities and asset consumption)
- C. Eliminating the role of the CAG
- D. Removing all Parliamentary oversight of government spending

Answer: B

Recognising the limitations of pure cash accounting, reform discussions have explored incorporating more accrual elements to give a fuller picture of government finances.