Module 6 · Equity and bond valuation P14 · 6.1 · 6.2

SM pp. 201–228 (exercise 229–236). **16–18 marks every paper since Dec'23** (expected 16.0): **Q3(b) multi-stage DDM in all 6 papers** and **Q4(a) a bond sum in all 6**, plus MCQs (ii) Gordon and (vi) bond value. The SM has **no duration and no convertible-bond section**, yet the exam asked convertibles four times and duration in Dec'25 — those parts follow ICMAI's Practice Workbook (Ch4) and are marked ⚠.

Paper	Q3(b) DDM	Q4(a) bond
Jun'23	–	convertible: straight value, conversion value / premium, downside risk, parity price
Dec'23	three-stage 18%, 12%, 6%	convertible worked backwards
Jun'24	three-phase (growth falls linearly) = SM Illus. 8	convertible debenture: premium, income differential
Dec'24	two-stage, g from ROE (DuPont), CAPM k	convertible (semi-annual): redemption v conversion
Jun'25	multi-stage backwards: find g	zero-coupon, tiered yields, call / put
Dec'25	**12%, 10%, then g = ROE × b; over / under-valued**	**price, duration, volatility, price after +100 / −75 bp** (= WB Ch4 illus. 10)
Jun'26	two-stage, g = ROE × b; price from P/E	value v market price, premium redemption (= MQP Q4(a))

HOW IT IS ASKED

- **Q3(b)**: dividends grow at given rates for 1–3 years, then at **g = ROE × retention**; PV factors given (one set is a distractor); compare with the market price.
- **Q4(a)**: PVIFA / PVIF given; value v market price; or duration table; or a convertible's five measures.
- **MCQs**: Gordon value (D0 × (1 + g)), price in 3 years, expected return D1/P0 + g, bond price at a market rate, semi-annual bond, issue price with premium redemption.

A Formula sheet — when to use

Formula	When to use · notes	SM
$\mathbf{V_0 = D_0 \div k}$	Zero growth (constant dividend for ever).	[SM 202]
$\mathbf{V_0 = D_1 \div (k - g)}$, $D_1 = D_0(1 + g)$	Constant growth (Gordon). Read "currently pays / just paid" = D_0; "expected / next" = D_1.	[SM 202]
$V = (1 - b)\ E_1 \div (k - g)$	Earnings and payout given; b = retention rate.	[SM 204]
$\mathbf{k = D_1 \div P_0 + g}$	Expected / required return from the price (dividend yield + growth).	[SM 204, SM 206]
$\mathbf{g = b \times ROE}$; $P_0/E_1 = (1 - b) \div [k - (ROE \times b)]$	Sustainable growth for the last stage; P/E from the DDM.	[SM 209]
$\mathbf{P_0 = \Sigma\ D_t \div (1 + k)^t + [D_{n+1} \div (k - g_n)] \times 1 \div (1 + k)^n}$	Multi-stage: PV of the high-growth dividends + PV of the price at the end of the high-growth period.	[SM 204]
$V_0 > P_0$ under-valued (buy / hold); $V_0 < P_0$ over-valued (sell / avoid)	The last line of every Q3(b).	[SM 206]
$\mathbf{P = C \times PVIFA_{r,n} + FV \times PVIF_{r,n}}$	Bond value; FV = redemption value (premium if redeemable at a premium). Semi-annual: C/2, r/2, 2n.	[SM 213–214]
Current yield = annual interest ÷ price	MCQ; ignores the gain or loss to maturity.	[SM 215, SM 218]
YTM ≈ [C + (M − P) ÷ n] ÷ (0.4 M + 0.6 P)	Approximate YTM; exact = trial and error with interpolation. Zero-coupon: $(FV \div P)^{1/n} - 1$.	[SM 217]

⚠ **Duration** = Σ (t × PV of cash flow) ÷ price; **volatility** (modified duration) = duration ÷ (1 + YTM); new price ≈ price × (1 ∓ volatility × change in yield)	Not in the SM — ICMAI Practice Workbook Ch4 illus. 10 and Dec'25 Q4(a).	WB
⚠ **Convertible**: straight value = PV of coupons + redemption at the plain-bond rate; conversion value = ratio × share price; conversion premium = (bond price − conversion value) ÷ conversion value; downside risk = (bond price − straight value) ÷ straight value; parity price = bond price ÷ ratio	Not in the SM (it only defines a convertible bond, SM 211) — ICMAI's answers and WB Ch4 illus. 4.	WB

B Multi-stage DDM · Q3(b) 6.1

1 · Dividends of the high-growth years
$D_1 = D_0(1 + g_1)$, $D_2 = D_1(1 + g_2)$ …

↓

2 · Stable growth
g = ROE × retention (or given); $D_{n+1} = D_n(1 + g)$

↓

3 · Price at the end of year n
$P_n = D_{n+1} \div (k - g)$

↓

4 · Discount
$V_0 = \Sigma D_t \times PVIF + P_n \times PVIF_n$ (use the factors at k)

↓

5 · Compare
V_0 v market price (or P/E × EPS) → under / over-valued

ICMAI layout: table Year · Growth · Dividend · PVIF · PV, then the terminal value line, then the total and the advice.

- The DDM is very **sensitive**: k from 15% to 16% → value ₹154.29 to ₹135 (12.5% fall); g from 8% to 9% → ₹181.67 (17.74% rise). [SM 203]
- Value grows by g each year: V_2 = ₹154.29 × (1.08) = ₹166.63. [SM 202–203]
- **P/E rises** with the payout ratio and with g; falls as k rises. High dividend yield + low P/E = limited growth; low yield + high P/E = growth prospects. [SM 208]
- If k < g, the constant-growth formula is meaningless (Additional illus. 3(a)). [SM 221]
- **Three-phase model**: growth g_a for A years, declines linearly in phase B, then g_n for ever (J24 Q3(b) asked it). [SM 206–207]
- Relative valuation: $P_0 = E_0$ × P/E multiple — avoids estimating g and k. [SM 207–208]

PROBLEMS BOX · MULTI-STAGE DDM (Q3(b) — RECOMPUTED BY SCRIPT m06_patterns.py)

WORKED PATTERN · SM ILLUSTRATION 6 (TWO-STAGE)

- D_0 ₹3.00; 25% for 5 years; then 7%; k 14%.
- Step I: PV of D_1–D_5 = ₹ (3.29 + 3.61 + 3.96 + 4.34 + 4.76) = ₹19.96.
- Step II: $P_5 = 3.00(1.25)^5(1.07) \div (0.14 - 0.07)$ = ₹140; ÷ $(1.14)^5$ = ₹72.71.
- Step III: ₹19.96 + ₹72.71 = **₹92.67**. [SM 205]

The SM rounds each PV (exact 19.94 → ₹92.62); either is accepted.

THREE-PHASE · SM ILLUSTRATION 8 (= J24 Q3(b) TYPE)

D 2.00 next year; 10% for four years; then 0.09, 0.08, 0.07, 0.06; k 14%: ₹6.656 + ₹4.27 + ₹17.761 → **₹28.69** ($(1.14)^7$ = 2.5023). [SM 207]

EPS + PAYOUT · ADDITIONAL ILLUS. 2 (CHANDRA)

EPS ₹7, DPS ₹2.50, 10% for 3 years then 3%, payout 60%, k 16%: EPS_4 ₹9.60, DPS_4 ₹5.76, P_3 = ₹44.31; P_0 = 2.37 + 2.25 + 2.13 + 28.39 = **₹35.14**. [SM 220]

DEC'25 Q3(b) LMN (OUR WORKING)

- D_0 ₹25; 12% then 10%; then g = 18% × 50% = **9%**; k 14% (ignore the 18% factors).
- D_1 28.00 · D_2 30.80 · D_3 33.572 → P_2 = 33.572 ÷ (0.14 − 0.09) = **₹671.44**.
- V_0 = 28 × 0.877 + 30.80 × 0.769 + 671.44 × 0.769 = **₹564.58** > ₹550 → **under-valued**, buy.

JUN'26 Q3(b) ZENITH (OUR WORKING)

- D_0 ₹3.60; 12% for 2 years; g = 15% × 40% = 6%; k 12%: D_1 4.032, D_2 4.516, D_3 4.787, P_2 = ₹79.78.
- V_0 = **₹70.78**; market price by P/E = 14 × ₹6 = **₹84** → over-valued.

PRACTISE THESE (MOST LIKELY FIRST)

D25, J26, D24 Q3(b) · J25 Q3(b) (find g backwards) · D23, J24 Q3(b) (three stages) · MQP Q3(b), PTP Q3(b) · MCQs D23, J24, D24, J25 Q1(ii) · SM Illus. 1–8, Additional illus. 1–10 (SM 219–223), solved case 1 (SM 234) · SM exercise MCQs

9–10 · **ICMAI Practice Workbook Ch4 illus. 1, 5, 6, 9; Ch1 illus. 8, 15** · MCQ bank Q56, Q57, Q66, Q68, Q70.

C Bond valuation · Q4(a) 6.2

- **Price varies inversely with yield**: required yield down → price up. [SM 219]
- **YTM** = the rate that equates the PV of the bond's cash flows with its price; earned only if held to maturity and coupons are reinvested at the YTM. [SM 215–216]
- **Yield to call**: return if bought at today's price and held till called (Illus. 15: 6.95%). The bond callable at the lower price has the higher YTM. [SM 210, SM 217–218, SM 225]
- **Realised compound yield** = (total ending wealth ÷ price)$^{1/n}$ − 1. [SM 218]
- Types (MCQ): zero coupon (issued at a discount), convertible, puttable (holder may sell back at par), callable, exchangeable (another firm's shares), high-yield / junk, perpetual, floating rate, inflation bonds. [SM 211–212]
- A premium bond (coupon > YTM) moves towards par as time passes — its price falls. [SM 226]

Bond-value layout
coupon × PVIFA + redemption × PVIF = value

↓

value v market price → under / over-priced

↓

duration table: Year · Cash flow · PVIF · PV · Year × PV

REVISION SHEET

Item	Rule	SM
Gordon	$D_1 \div (k - g)$	[SM 202]
Return	$D_1 \div P_0 + g$	[SM 206]
Growth	b × ROE	[SM 209]
Bond value	C × PVIFA + FV × PVIF	[SM 213]
YTM approx	[C + (M − P)/n] ÷ (0.4M + 0.6P)	[SM 217]
Current yield	coupon ÷ price	[SM 215]
⚠ Duration	Σ t × PV ÷ price; ÷ (1 + YTM) = volatility	WB Ch4

TRAPS

- D_0 v D_1: "has just paid" is D_0 — grow it once before Gordon.
- Terminal value at the end of year n uses D_{n+1} and is discounted with the year-n factor, not year n + 1.
- Two PV tables given: use the one at the required return k; the other is a distractor (or for the bond's YTM).
- Premium redemption: discount the redemption value (₹1,050 / ₹1,060), not the face value.
- Semi-annual: halve the coupon and the rate, double the periods.
- Convertible: the straight value uses the **plain-bond** rate, not the coupon.

MEMORY HOOK

"Grow, settle, cap, discount, compare" — the five lines of every Q3(b).

PROBLEMS BOX · BOND (Q4(a) — RECOMPUTED BY SCRIPT)

WORKED PATTERN · SM ILLUSTRATIONS 10–12, ADDITIONAL 11

- 10-year 12% bond, ₹10,000, yield 13%: 1200 × 5.426 + 10000 × 0.295 = **9461.2**. [SM 213]
- 8-year 12%, ₹1,000, semi-annual, 14%: 60 × 9.447 + 1000 × 0.339 = **₹906**. [SM 214]
- Redeemable at ₹1,050, 12% coupon, 13%: 651.12 + 309.75 = **₹960.87**. [SM 224]

⚠ DURATION · ICMAI WORKBOOK CH4 ILLUS. 10

₹10,000, 10%, 5 years, YTM 15%: price ₹8,324.20; Σ year × PV = 33,987.50 → duration **4.083 years**; volatility 4.083 ÷ 1.15 = **3.5504**.

DEC'25 Q4(a) (OUR WORKING, SAME TEMPLATE)

- ₹1,000, 11%, 6 years, YTM 15%: 110 × 3.784 + 1000 × 0.432 = **₹848.24**.

- YTM approx (₹850, 8%, 9 years): (80 + 16.66) ÷ (400 + 510) = **10.62%**. [SM 217]

- Duration **4.576 years**; volatility 4.576 ÷ 1.15 = **3.979%**.
- +100 bp: 848.24 × (1 − 0.03979) = **₹814.49**; −75 bp: 848.24 × (1 + 0.75 × 0.03979) = **₹873.55**.

⚠ CONVERTIBLE · JUN'23 Q4(a) SROIC (OUR WORKING)

- Straight value at 9.5%: 85 × 2.5089 + 1000 × 0.7617 = **₹974.96**; conversion value 25 × ₹45 = **₹1,125**.
- Premium (1,175 − 1,125) ÷ 1,125 = **4.44%**; downside risk (1,175 − 974.96) ÷ 974.96 = **20.52%**; parity price 1,175 ÷ 25 = **₹47**.

PRACTISE THESE

D25, J26 Q4(a) · MQP Q4(a) (= J26), PTP Q4(a) · **convertibles J23, D23, J24, D24 Q4(a)** (due) · J25 Q4(a) (zero coupon) · MCQs J25 Q1(iv), D25 Q1(vi), J26 Q1(vi), MQP / PTP Q1(vi) · SM Illus. 9–15, Additional illus. 11–24 (SM 224–227) · **ICMAI Practice Workbook Ch4 illus. 2, 3, 4, 7, 8, 10** · MCQ bank Q58–Q65, Q67, Q69, Q71–Q73, Q213.