

# **SOLUTIONS TO NUMERICAL REVIEW QUESTIONS**

## CHAPTER 2

### Solution RQ.2.11

- (1) The future value of an investment compounded annually =  $F_n = P(1 + i)^n = P \times \text{FIVF}_{i,n} = F_{10} = \text{Rs } 100(1 + 0.10)^{10} = \text{Rs } 100 (2.5937) = \text{Rs } 259.4$
- (2) The future value of an annuity =  $S_n = A \times \text{FVIFA}_{i,n} = \text{Rs } 100 \times 15.937 = \text{Rs } 1,593.7$ .

### Solution RQ.2.12

- (i) (a) Rs 6,000 after 1 year at 10 per cent discount =  $P = \text{Rs } 6,000(0.9091) = \text{Rs } 5,454.6$ .
- (i) (b) Rs 9,000 after 4 years at 10 per cent discount =  $P = \text{Rs } 9,000(0.6830) = \text{Rs } 6,147$ .
- At 10 per cent required rate, the investor should choose Rs 9,000 after 4 years.
- (ii) (a) Rs 6,000 after 1 year at 20 per cent discount =  $P = \text{Rs } 6,000(0.8333) = \text{Rs } 4,999.8$ .
- (ii) (b) Rs 9,000 after 4 years at 20 per cent discount =  $P = \text{Rs } 9,000(0.4823) = \text{Rs } 4,340.7$ .
- At 20 per cent required rate, the investor should choose Rs 6,000 after 1 year.

**Solution RQ.2.13**  $P_n$ (present value of annuity) =  $A \times \text{PVIFA}_{i,n} = P_{10} = \text{Rs } 2,00,000 (6.1446) = \text{Rs } 12,28,920$ .

**Solution RQ.2.14**  $S_n = A \times \text{FVIFA}_{i,n}$  or  $A = S_n / \text{FVIFA}_{i,n} = \text{Rs } 100 / 6.1051 = \text{Rs } 16.38$

**Solution RQ.2.15**  $A = \text{Rs } 6,00,000 / \text{PVIFA}_{1,20} = \text{Rs } 6,00,000 / 18.0456 = \text{Rs } 33,249.1$ . Monthly interest = 12 per cent/12 = 1 per cent.

**Solution RQ.2.16** Amount of equal instalment,  $A = P_n / \text{PVIFA}_{i,n} = \text{Rs } 1,000 / 2.2832 = \text{Rs } 437.98$

### Solution RQ.2.17

$$\begin{aligned} P_n &= A \times \text{PVIFA}_{i,n} \\ \text{PVIFA}_{i,n} &= P_n / A = \text{Rs } 1,000 / \text{Rs } 94.56 = 10.5753 \end{aligned}$$

According to Table A-4 (Appendix), a PVIFA of 10.5753 for 12 periods at interest (i) = 2 per cent. The annual interest rate is therefore  $0.02 \times 12 = 24$  per cent.

## CHAPTER 3

### Solution RQ.3.16

$$\begin{aligned} \text{(i)} \quad \beta_{\text{equity}} &= \beta_{\text{assets}} (1 + \text{Debt/Equity}) \\ 1.5 &= \beta_{\text{assets}} (1 + 2/3) \\ \beta_{\text{assets}} &= 1.5 \times 3/5 \\ &= 0.9 \end{aligned}$$

$$\begin{aligned} \text{(ii)} \quad \text{Cost of equity} &= \text{Risk-free rate} + \beta(\text{Risk Premium}) \\ &= 8\% + 1.5(10\%) = 23\% \end{aligned}$$

$$\text{Cost of debt} = 8\%$$

$$\text{Weighted average cost of capital}$$

$$\begin{aligned} &= \text{Cost of equity (equity/ debt+equity)} + \text{cost of debt(debt/debt+equity)} \\ &= 23\%(0.6) + 8\% (0.4) \\ &= 13.8\% + 3.2\% = 17\% \end{aligned}$$

### Solution RQ.3.17

$$\begin{aligned} \text{Cost of equity (K}_e\text{)} &= \text{Risk-free rate} + (\text{Risk Premium}) \\ &= 9\% + 1.5(18\%-9\%) = 22.5\% \end{aligned}$$

$$\text{Expected dividend next year (D}_1\text{)} = \text{Rs.3}$$

$$\text{Growth rate in dividends (g)} = 8\%$$

$$\begin{aligned} \text{Expected price (P)} &= D_1 / (K_e - g) \\ &= 3 / (.225 - .08) \\ &= \text{Rs.20.7} \end{aligned}$$

### Solution RQ.3.18

(a) Computation of standard deviation of shares, X and Y

	$r_i(\%)$	$P_i$	$r_i P_i(\%)$	$(r_i - \bar{r})(\%)$	$(r_i - \bar{r})^2$	$(r_i - \bar{r}) 2P_i(\%)$
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Share X:</b>						
	(16)	0.1	(1.6)	(22.4)	501.8	50.2
	2	0.2	0.4	(4.4)	19.4	3.9
	8	0.4	3.2	1.6	2.6	1.0
	12	0.2	2.4	5.6	31.4	6.3
	20	0.1	2	13.6	185.0	18.5
			$\sigma^2 = 6.4$			$\sigma^2 = 79.9$
Since $\sigma^2 = 80$ , $\sigma = \sqrt{80} = 8.94$ per cent						
<b>Share Y:</b>						
	(18)	0.1	(1.8)	(36.2)	1,310.4	131.04
	12	0.2	2.4	(6.2)	38.4	7.68
	18	0.4	7.2	(0.2)	0.04	0.02
	32	0.2	6.4	13.8	190.4	38.08
	40	0.1	4	21.8	475.2	47.52
			$\sigma = 18.2$			$\sigma^2 = 224.34$
Since $\sigma^2 = 224.34$ , $\sigma = \sqrt{224.34} = 14.98$ per cent						

(b) Coefficient of variation:

$$\text{Share X} = 8.94/6.4 = 1.4$$

$$\text{Share Y} = 14.98/18.2 = 0.82$$

Share X is more risky since it has larger coefficient of variation (a measure of relative risk).

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##### Solution RQ.3.19

(a)  $p_{xy} = 0.1$

(i) X, 100 per cent:  $\sigma/\bar{r} = 0.20/0.14 = 1.43$

(ii) Y, 100 per cent:  $\sigma/\bar{r} = 0.30/0.09 = 3.33$

(iii) X, 50 per cent; Y, 50 per cent:

$$\bar{r}_p = w_x \bar{r}_x + w_y \bar{r}_y = (0.5)(0.14) + (0.5)(0.09) = 11.5 \text{ per cent}$$

$$\begin{aligned}\sigma_p &= \sqrt{w_x^2 \sigma_x^2 + w_y^2 \sigma_y^2 + 2w_x w_y p_{xy} \sigma_x \sigma_y} \\ &= \sqrt{(0.5)^2 (0.2)^2 + (0.5)^2 (0.3)^2 + 2(0.5)(0.5) p_{xy} (0.2)(0.3)} \\ &= \sqrt{0.01 + 0.0225 + 0.03 p_{xy}} = \sqrt{0.035 + 0.03 p_{xy}} \\ &= \sqrt{0.0325 + 0.03(0.1)} = \sqrt{0.0355} = 0.1884 = 18.84 \text{ per cent}\end{aligned}$$

(b)  $p_{xy} = -1$

(i) and (ii) same as in (a) (i) and (ii).

(iii)  $r_p = 11.5$  per cent

$$r_p = \sqrt{0.0325 + 0.03(-1)} = \sqrt{0.0025} = 0.05 = 5 \text{ per cent}$$

##### Solution RQ.3.20

Security	Risk-free return ( $r_f$ ) (per cent)	$+ b[r_m - r_f] =$ (per cent)	$r$ (per cent)
(1)	(2)	(3)	(4)
$X_1$	7.75	$1.5(14.25 - 7.75 = 6.5)$	17.50
$X_2$	7.75	$1.2(14.25 - 7.75 = 6.5)$	15.55
$X_3$	7.75	$1.0(14.25 - 7.75 = 6.5)$	14.25
$X_4$	7.75	$0.9(14.25 - 7.75 = 6.5)$	13.60

##### Solution RQ.3.21

$$r = r_f + b(r_m - r_f)$$

$$0.16 = 0.0775 + 2(r_m - 0.0775)$$

$$0.16 = 0.0775 + 2r_m - 0.155$$

$$0.2375 = 2r_m$$

$$r_m = 0.11875 = 11.87 \text{ per cent.}$$

##### Solution RQ.3.22

$$r = r_f + b(r_m - r_f)$$

$$0.18 = 0.0825 + b(0.14 - 0.0825)$$

$$0.18 = 0.0825 + b(0.0575)$$

$$0.0975 = b(0.0575)$$

$$b = 1.7$$

##### Solution RQ.3.23

Expected returns

Portfolio	Expected return (per cent)	Actual return (per cent)	Difference between actual and expected returns (per cent)
X <sub>1</sub>	$0.10 + 0.90 (0.18 - 0.10) = 17.2$	18	0.8
X <sub>2</sub>	$0.10 + 1.12 (0.18 - 0.10) = 19.0$	18	(1)
X <sub>3</sub>	$0.10 + 1.50 (0.18 - 0.10) = 22.0$	24	2
X <sub>4</sub>	$0.10 + 0.95 (0.18 - 0.10) = 17.6$	16	(1.6)

Portfolios X<sub>1</sub> and X<sub>3</sub> have been better than expected. The performance of X<sub>1</sub> has exceeded the expected return by 4.65 per cent ( $0.8 \div 17.2$ ), while the performance of X<sub>3</sub> has exceeded the expected return by 9.1 per cent ( $2 \div 22$ ). Thus, portfolio X<sub>3</sub> has shown the best performance.

## CHAPTER 4

### Solution RQ.4.10

Annual interest paid ( $I$ ) = Rs.10

Number of years to maturity ( $n$ ) = 12

Maturity value ( $M$ ) = Rs.100

Required rate of return on bond ( $k_d$ ) = 8%

$$\begin{aligned}\text{Value of the PIL's bond } (B) &= I \times (\text{PVIFA}_{0.08,12}) + M \times (\text{PVIF}_{0.08,12}) \\ &= \text{Rs.}10 \times 7.536 + \text{Rs.}100 \times 0.397 \\ &= \text{Rs.}75.36 + \text{Rs.}39.70 \\ &= \text{Rs.}115.06\end{aligned}$$

The price of a bond depends on the coupon payment and the required rate of return from the bond. The required rate of return depends on the risk associated with the bond. If the coupon rate is more than the required rate of return, the bond sells at a premium over its par value. Because a similar risk bond, having a coupon rate of 10 per cent, sells at a premium over its par value, it earns a return of 8 per cent which is less than the coupon rate.

If the required rate of return is 10 per cent (i.e., equal to the coupon rate), the value of the bond will be equal to its par value, i.e. Rs.100.

### Solution RQ.4.11

The expected price ( $P_0$ ) =  $[D_1/(1+r)] + [P_1/(1+r)] = [\text{Rs } 4/(1.10)] + [\text{Rs } 26/(1.10)] = (\text{Rs } 4 \times 0.9091) + (\text{Rs } 26 \times 0.9091) = \text{Rs } 3.64 + \text{Rs } 23.64 = \text{Rs } 27.28$ .

### Solution RQ.4.12

$$P_0 = D/r = \text{Rs } 3/0.14 = \text{Rs } 21.43.$$

### Solution RQ.4.13

$$P_0 = \sum_{t=1}^5 \frac{D_t}{(1+r)^t} + \frac{P_5}{(1+r)^5}$$

$$\text{Rs } 25 = \sum_{t=1}^5 \frac{D_t}{(1+0.15)^t} + \frac{P_5}{(1+0.15)^5}$$

$$(a) \text{ Present value of dividends, years } 1 - 5 \left[ \sum_{t=1}^5 \frac{D_t}{(1+0.15)^t} \right] = \text{Rs } 2(0.8696) + \text{Rs } 2(0.7561) +$$

$$\text{Rs } 2.20(0.6575) + \text{Rs } 2.50(0.5718) + \text{Rs } 2.50(0.4972) = \text{Rs } 1.74 + \text{Rs } 1.51 + \text{Rs } 1.45 + \text{Rs } 1.43 + \text{Rs } 1.24 = \text{Rs } 7.73$$

$$(b) \text{ Therefore, } \text{Rs } 25 = \text{Rs } 7.37 + P_5/(1.15)^5$$

$$\text{Rs } 25 = \text{Rs } 7.37 + P_5(0.4972)$$

$$P_5(0.4972) = \text{Rs } 25 - \text{Rs } 7.37$$

$$P_5 = \text{Rs } 17.63/0.4972 = \text{Rs } 35.46$$

### Solution RQ.4.14

$$r = (D_1/P_0) + g$$

(a) Rate of growth, 5 per cent:

$$r = (\text{Rs } 4/\text{Rs } 100) + 0.05 = 0.04 + 0.05 = 9 \text{ per cent}$$

(b) Rate of growth, 10 per cent:

$$r = (\text{Rs } 4/\text{Rs } 100) + 0.10 = 14 \text{ per cent}$$

(c) Rate of growth, 0 (zero) per cent (no growth):

$$r = \text{Rs } 4/\text{Rs } 100 = 4 \text{ per cent.}$$

**Solution RQ.4.15**

Dividend yield =  $[\text{Rs } 2(1 + 0.10)]/\text{Rs } 40 = \text{Rs } 2.20/\text{Rs } 40 = 0.055 = 5.5$  per cent.

Capital gain yield = rate of return – dividend yield =  $0.18 - 0.055 = 12.5$  per cent.

## CHAPTER 5

### **Solution RQ.5.13**

Cash flow statement for the year ending 2 (Amount in Rs thousands)

<i>Particulars</i>	<i>Amount</i>
<i>Cash flow from operating activities:</i>	
Net profit before taxation and extraordinary items	Rs 2,300
Adjustment for: Depreciation	1,000
Interest expenses	800
Operating profit before working capital changes	4,100
Increase in inventories	(200)
Increase in debtors	(200)
Increase in bills payable	1100
Increase in creditors	700
Cash generated from operations	5,500
Income-taxes paid	1,050
Net cash from operating activities	4,450
<i>Cash flow from investing activities:</i>	
Purchase of buildings, plant and machinery	(2,200)
Net cash used in investing activities	(2,200)
<i>Cash flow from financing activities:</i>	
Interest paid	800
Dividends paid	1,050
Net cash used in financing activities	(1,850)
Net increase in cash and cash-equivalents	400
Cash and cash-equivalents at beginning of year 2	2,200
Cash and cash-equivalents at end of year 2	2,600

### **Working Notes:**

<i>Provision for taxation account</i>			
To cash (payment of taxes, balancing figure)	Rs 1,050	By balance b/d	Rs 400
To balance c/d	155	By P&L a/c	805
	1,205		1,205
<i>Building, plant and machinery account</i>			
To balance b/d	Rs 5,800	By depreciation	Rs 1,000
To cash (purchases of fixed assets, balancing figure)	2,200	By balance c/d	7,000
	8,000		8,000



**Solution RQ.5.14**

Cash flow statement of 'A' limited for the year ending March 31, 2008 (indirect method).

Particulars		Amount
<i>Cash flow from operating activities:</i>		
Net profit before taxation and extraordinary items	Rs 16,00,000	
Adjustment for: Depreciation	6,00,000	
Operating profit before working capital changes	22,00,000	
Increase in debtors	(1,80,000)	
Decrease in stock	16,80,000	
Increase in advances	(12,000)	
Decrease in sundry creditors	(60,000)	
Increase in outstanding expenses	2,40,000	
Cash generated from operations	38,68,000	
Income taxes paid	8,68,000	
Net cash from operating activities		Rs 30,00,000
<i>Cash flows from investment activities:</i>		
Purchase of land	(4,80,000)	
Purchase of buildings and equipments	(28,80,000)	
Proceeds from sale of equipment	3,60,000	
Net cash used in investing activities		(30,00,000)
<i>Cash flows from financing activities:</i>		
Proceeds from issuance of share capital	Rs 8,40,000	
Dividends paid	(7,20,000)	
Net cash from financing activities		1,20,000
Net increase in cash from cash-equivalents		1,20,000
Cash and cash-equivalents at the beginning of year		6,00,000
Cash and cash-equivalents at the end of the year		7,20,000

**Working Notes:**

1. Net profit before taxation and extraordinary items

Net operating profit	Rs 7,20,000	
Add provision for taxation	8,80,000	Rs 16,00,000

2. Purchase of buildings and equipments

*Building and equipment account (Gross)*

To Opening balance	Rs 36,00,000	By Sale of equipment	
To Purchases during 2008		(original cost)	Rs 7,20,000
(balancing figure)	28,80,000	By Closing balance	57,60,000
	64,80,000		64,80,000

*Accumulated depreciation account*

To Depreciation written off on sale		By Opening balance	Rs 12,00,000
of equipment (balancing figure)	Rs 4,80,000	By Depreciation (2008)	6,00,000
To Closing balance	13,20,000		
	18,00,000		18,00,000

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### 3. Proceeds from sale of equipment

Original cost of equipment	Rs 7,20,000	
Less accumulated depreciation	4,80,000	
Book value	2,40,000	
Add profit on sale of equipment	1,20,000	Rs 3,60,000

### Solution RQ.5.15

Cash flow statement of Royal Limited as per AS-3 for the current year-ended March 31, 2008 (indirect method).

Particulars	Amount
<b>Cash flows from operating activities:</b>	
Net profit before taxation and extraordinary items	Rs 7,69,200
<i>Adjustments for:</i>	
Depreciation	4,20,000
Preliminary expenses written off	48,000
Fixed assets written off	12,000
Loss on sale of fixed assets (Rs 2,40,000 – Rs 84,000 – 1,20,000)	36,000
Premium on redemption of debentures (Rs 2,88,000 × 0.05)	14,400
Operating profit before working capital changes	12,99,600
Increase in current assets Rs 12,72,000 – (Rs 11,34,000 + Rs 28,800 increase in stock valuation)	(1,09,200)
Increase in current liabilities (Rs 6,24,000 – 5,76,000)	48,000
Cash generated from operations	12,38,400
Less income taxes paid	4,32,000
Net cash from operating activities	Rs 8,06,400
<b>Cash flows from investing activities:</b>	
Purchase of fixed assets	(Rs 10,20,000)
Sale of fixed assets	1,20,000
Sale of investments (Rs 4,80,000 – 3,84,000 + Rs 48,000 profit)	1,44,000
Net cash used in investing activities	(7,56,000)
<b>Cash flows from financing activities:</b>	
Proceeds from issuance of share capital	Rs 4,80,000
Redemption of 9% debentures (Rs 2,88,000 ÷ 1.05)	(3,02,400)
Dividends paid (Rs 1,44,000 – 18,000)	1,26,000
Net cash from financing activities	51,600
Net increase in cash and cash-equivalents	1,02,000
Cash and cash-equivalents at the beginning of year	2,10,000
Cash and cash-equivalents at the end of year	3,12,000

### Working Notes:

#### 1. Determination of net profit before taxation and extraordinary items:

Increase in profit and loss account Rs 3,60,000 – (Rs 2,88,000 + Rs 28,800 increase in value of opening stock)	Rs 43,200
Plus increase in general reserve	1,44,000
Plus proposed dividend of current year	1,74,000
Plus provision for taxes of current year	4,08,000
	7,69,200

2. Increase in valuation of opening stock ( $\text{Rs } 2,59,200/0.9 = \text{Rs } 2,88,000$ ) – Rs 2,59,200      Rs 28,800
3. Purchase of fixed assets:

*Fixed assets account (Gross)*

To Opening balance	Rs 38,40,000	By Cash	Rs 1,20,000
To Purchases (balancing figure)	10,20,000	By Accumulated depreciation	84,000
		By Loss on sale	36,000
		By Writing off	60,000
		By Closing balance	45,60,000
	48,60,000		48,60,000

## CHAPTER 6

### Solution RQ.6.15

- (i) (a) Current ratio = (Cash + Debtors + Stock + Prepaid insurance)/(Creditors + Bills payable + Other current liabilities) = (Rs 1,60,000 + Rs 3,20,000 + Rs 4,80,000 + Rs 12,000)/(Rs 1,04,000 + Rs 2,00,000 + Rs 20,000) = 3 : 1.
- (b) Acid test ratio = (Current assets – Stock – Prepaid insurance)/Current liabilities = (Rs 9,72,000 – Rs 4,92,000)/Rs 3,24,000 = 1.48 : 1.
- (c) Stock turnover = Cost of goods sold/Average stock = Rs 30,80,000/Rs 4,40,000 = 7 times.
- (d) Debtors' turnover = Cost of goods sold/Average debtors = Rs 40,00,000/Rs 3,30,000 = 12.12 times.
- (e) Gross profit ratio = (Gross profit/Sales) × 100 = Rs (9,20,000/Rs 40,00,000) × 100 = 23 per cent.
- (f) Net profit ratio = (Net profit/Sales) × 100 = (Rs 1,56,000/Rs 40,00,000) × 100 = 3.9 per cent.
- (g) Operating ratio = [(Cost of goods sold + Operating Expenses)/Sales] × 100 = [(Rs 30,80,000 + Rs 6,80,000)/Rs 40,00,000] × 100 = 94 per cent.
- (h) Earnings per share (EPS) = Earning available to equityholders/Number of equity shares = Rs 1,56,000/10,000 = Rs 15.6.
- (i) Rate of return on equity capital = (Rs 1,56,000/Rs 13,68,000) × 100 = 11.4 per cent.
- (j) Market value of the share = EPS × P/E ratio = Rs 15.6 × 10 times = Rs 156.
- (ii) *Effect of the transactions on current ratio:* (a) Improve, (b) Improve, (c) Improve, (d) No effect, (e) Weaken, (f) No effect, (g) No effect, (h) No effect, and (i) Weaken.

### Solution RQ.6.16

#### (i) Liquidity ratios

- (a) Current ratio = CA/CL = Rs 25,88,000/Rs 6,40,000 = 4.04 : 1 (previous year); Rs 30,52,000/Rs 8,00,000 = 3.82 : 1 (current year)
- (b) Acid-test ratio = (Rs 25,88,000 – Rs 18,68,000)/Rs 6,40,000 = 1.125 : 1 (previous year); (Rs 30,52,000 – Rs 21,72,000)/Rs 8,00,000 = 1.1 : 1 (current year)

#### (ii) Solvency ratios

##### (a) Debt-equity ratios

- (1) Total outside debts/Equity funds = Rs 22,40,000/Rs 24,68,000 = 0.91 (previous year); Rs 24,00,000/Rs 28,12,000 = 0.85 (current year)
- (2) Long-term debts/Equity funds = Rs 16,00,000/Rs 24,68,000 = 0.65 (previous year); Rs 16,00,000/Rs 28,12,000 = 0.57 (current year)

##### (b) Interest coverage ratio

= EBIT/Interest charges = Rs 12,00,000/Rs 1,60,000 = 7.5 times (current year)

#### (iii) Profitability ratios (current year)

- (a) Gross profit ratio = (Gross profit/Sales) × 100 = (Rs 12,00,000/Rs 40,00,000) × 100 = 30 per cent
- (b) Net profit ratio = (Net profit/Sales) × 100 = (Rs 6,76,000/Rs 40,00,000) × 100 = 16.9 per cent.
- (c) Return on total resources = [(EAT + Interest – Tax savings on interest)/Total assets] × 100 = [(Rs 6,76,000 + Rs 1,60,000 – Rs 56,000)/Rs 64,00,000] × 100 = 12.2 per cent.
- (d) Return on capital employed = [(EAT + Interest – Tax savings on interest)/Total capital employed] × 100 = [(Rs 6,76,000 + Rs 1,60,000 – Rs 56,000)/44,12,000] × 100 = 17.7 per cent.
- (e) Return on equity funds = (Net profit after taxes/Equity funds) × 100 = (Rs 6,76,000/Rs 28,12,000) × 100 = 24 per cent.

*Notes:* Ratios (c), (d) and (e) can also be determined by taking average total assets/capital employed/equity funds.

*(iv) Activity ratios*

(a) Debtors turnover = Rs 40,00,000/Rs 3,60,000 = 11.1 times

(b) Stock turnover = Rs 28,00,000/Rs 20,00,000 = 1.4 times

(c) Total assets turnover = Rs 28,00,000/Rs 64,00,000 = 0.44 times

The company's position is quite sound from the point of view of liquidity, solvency and profitability. However, its activity ratios, particularly in term of the utilisation of total assets and holding of stocks, do not seem to be satisfactory.

**Solution RQ.6.17**

The contributing factor for the divergent trend is the accumulation of stocks with the company over the years. It is clearly manifested in the stock turnover ratio, which has come down from 6 times in year 1 to 4 times in year 3.

**Solution RQ.6.18****(i) Rate of return (ROR) on shareholders' funds**

= (Rs 4,94,000\*/Rs 20,65,000\*\*) × 100 = 23.9 per cent (X Ltd)

= (Rs 5,07,000\*\*/Rs 22,50,000) × 100 = 22.5 per cent (Y Ltd)

X Ltd is using the shareholders' money more profitably.

**(ii) (a) Current ratio** = Rs 17,70,000/Rs 9,00,000 = 1.97 (X), Rs 19,00,000/ Rs 10,50,000 = 1.81 (Y)(b) *Acid test ratio* = Rs 5,40,000/Rs 9,00,000 = 0.6 (X), Rs 9,50,000/ Rs 10,50,000 = 0.9 (Y)

Y Ltd is better able to meet its current debts.

**(iii) (a) Debt-equity ratio** = Rs 14,00,000/Rs 20,65,000 = 0.68 (X), Rs 20,50,000/ Rs 22,50,000 = 0.91 (Y)(b) *Interest coverage ratio* = Rs 8,00,000/Rs 40,000 = 20 times (X), Rs 8,60,000/ Rs 80,000 = 10.75 times (Y)

The debentures of X Ltd should be bought.

**(iv) Debtors collection period** = (360 × Rs 3,30,000)/Rs 56,00,000 = 21 days (X Ltd), (360 × Rs 6,30,000)/Rs 82,00,000 = 28 days (Y Ltd)

X Ltd collects its receivables faster.

**(v) Creditors payment period** = (360 × Rs 9,00,000)/Rs 40,00,000 = 81 days (X Ltd), (360 × Rs 10,50,000)/Rs 64,80,000 = 58 days (Y Ltd)

X Ltd is extended credit for a longer period by the creditors.

**(vi) Stock turnover ratio** = Rs 40,00,000/Rs 12,30,000 = 3.25 times (X), Rs 64,80,000/Rs 9,50,000 = 6.82 times (Y) = 360 days/3.25 = 111 days (X), 360 days/6.82 = 53 days (Y)

Length of time required for conversion of investment in stock to cash:

111 days + 21 days = 132 days (X)

53 days + 28 days = 81 days (Y)

**(vii) Dividend payout ratio** = Rs 1,00,000/Rs 4,94,000 = 20.2 per cent (X), Rs 1,80,000/Rs 5,07,000 = 35.5 per cent (Y)

Retention ratio = 100 – 20.2 = 79.8 per cent (X), 100 – 35.5 = 64.5 per cent (Y)

X Ltd retains the larger proportion of its income in the business

\* Rs 56,00,000 – Rs 51,06,000

\*\* Rs 82,00,000 – Rs 76,93,000

**Solution RQ.6.19**

- (i) (a) Current ratio = Rs 1,09,100/Rs 58,700 = 1.86  
 (b) Stock turnover = Rs 1,52,500/Rs 60,800 = 2.51 times  
 (c) Collection period =  $(360 \times \text{Rs } 36,000)/\text{Rs } 2,25,000 = 58$  days  
 (d) Total debt/Shareholders' equity =  $(\text{Rs } 92,700/\text{Rs } 1,67,400) \times 100 = 55$  per cent.  
 (e) Fixed charge cover before tax =  $\text{EBIT}/\text{Interest} + \text{Dividend on preference shares} = \text{Rs } 21,700/\text{Rs } 6,900 = 3.14$  times.  
 (f) Turnover of assets =  $\text{Rs } 1,52,500/\text{Rs } 2,60,100 = 0.59$  times  
 (g) Income before tax/Sales =  $(\text{Rs } 18,800/\text{Rs } 2,25,100) \times 100 = 8.36$  per cent.  
 (h) Rate of return on shareholders' equity =  $(\text{Rs } 12,220/\text{Rs } 1,27,400) \times 100 = 9.6$  per cent.
- (ii)

Financial ratios	Industry	Company
(a) Current ratio	2.2	1.86
(b) Stock turnover (times)	2.8	2.51
(c) Collection period (days)	56	58
(d) Total debt/Shareholders' equity	0.45	0.55
(e) Fixed charge coverage before tax (times)	10	3.14
(f) Turnover assets (times)	1.35	0.59
(g) Income before tax/Sales	0.119	0.0836
(h) Rate of return on equity funds	0.15	0.096

The financial position of Royal Plastics Ltd. *vis-a-vis* industry is weaker both in terms of profitability and solvency. It is indicated by lower profitability ratios (g and h). The higher debt-equity ratio and lower fixed charge coverage before tax are indicative of weakness from the point of view of its solvency. Its liquidity position also does not seem to be very satisfactory. The acid test ratio is likely to be much below one as stock turnover ratio is very low.

**Solution RQ.6.20**

*B* need not necessarily be better than *A* only because its ratios are better in six out of eight areas for the following reasons:

- (a) Profitability ratios of *A* are better than those of *B*. In fact, the rate of return on total assets of *B* is lower than that of the industry.  
 (b) Liquidity ratios of *B* cannot be considered to be better than those of *A*, merely on the ground that they are very high. In fact, these ratios reflect the excessive investment of the former in current assets, depressing its rate of return. After all, working capital investment involves cost. This is true particularly in the case of stock. Low stock turnover ratio reflects excessive investment in stock.  
 (c) Low debt-asset ratio and, consequently, higher interest coverage ratio may be indicative of *B* not availing of debt for enhancing the rate of return to the equityholders.  
 (d) Higher debtors' turnover ratio of *B* may be indicative of its rigorous credit sales as well as rigorous credit collection policy leading to low credit sales, eventually leading to low profits. The low operating ratio certainly goes to the credit of *B*.

**Solution RQ.6.21**

The company has made additional borrowings through the issue of debentures or by taking long-term loans in year 2, entailing an increase in the debt-equity ratio from 15 to 40 per cent in year 2. The amounts so obtained could have been invested either in stock, or remained in the form of idle cash balance with the company. This is likely to have resulted in higher current ratio, higher acid-test ratio, higher debt-equity ratio and low stock turnover. As a possible consequence, the rate of return on total assets has declined from 15 in year 1 to 10 per cent in year 2.

In year 3, the situation appears to have become worse. The reasons may be: (a) high operating expenses ratio not being matched by increase in sales price; (b) excessive interest cost due to large amount of borrowings; (c) higher inventory cost; (d) liberal grant of credit, as revealed by lower debtors' turnover ratio, resulting in bad debts.

**Solution RQ.6.22**

Statement of comparative ratios of ABC Ltd. and XYZ Ltd.

	ABC Ltd.	XYZ Ltd.
(i) <i>Liquidity Ratios</i>		
(a) Current ratio (CA ÷ CL)	$\frac{\text{Rs } 8,75,000}{\text{Rs } 4,42,000} = 1.98$	$\frac{\text{Rs } 12,61,000}{\text{Rs } 7,49,000} = 1.68$
(b) Acid-test ratio (QA ÷ CL)	$\frac{\text{Rs } 5,44,000}{\text{Rs } 4,42,000} = 1.23$	$\frac{\text{Rs } 4,52,000}{\text{Rs } 7,49,000} = 0.60$
(ii) <i>Profitability Ratios</i>		
(a) Net profit ratio (NP ÷ Sales) × 100 =	$\frac{\text{Rs } 1,23,000}{\text{Rs } 32,00,000} \times 100 = 3.84\%$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 30,00,000} \times 100 = 5.27\%$
(b) ROR on total assets (NP ÷ Total assets) × 100	$\frac{\text{Rs } 1,23,000}{\text{Rs } 24,74,000} \times 100 = 4.97\%$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 28,51,000} \times 100 = 5.54\%$
(c) ROR on owners' funds (NP ÷ Equity funds) × 100	$\frac{\text{Rs } 1,23,000}{\text{Rs } 12,32,000} \times 100 = 9.98\%$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 14,42,000} \times 100 = 10.96\%$
(d) EPS (NP ÷ Number of shares)	$\frac{\text{Rs } 1,23,000}{\text{Rs } 1,00,000} = \text{Rs } 1.23$	$\frac{\text{Rs } 1,58,000}{\text{Rs } 80,000} = \text{Rs } 1.97$
(iii) <i>Activity Ratios</i>		
(a) Stock turnover (Sales ÷ Closing stock)	$\frac{\text{Rs } 32,00,000}{\text{Rs } 3,31,000} = 9.7 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 8,09,000} = 3.71 \text{ times}$
(b) Fixed assets turnover (Sales ÷ Fixed assets) <sup>1</sup>	$\frac{\text{Rs } 32,00,000}{\text{Rs } 15,99,000} = 2 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 15,90,000} = 1.89 \text{ times}$
(c) Current assets turnover (Sales ÷ Current assets) <sup>1</sup>	$\frac{\text{Rs } 32,00,000}{\text{Rs } 8,75,000} = 3.66 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 12,61,000} = 2.38 \text{ times}$
(d) Total assets turnover (Sales ÷ Total assets) <sup>1</sup>	$\frac{\text{Rs } 32,00,000}{\text{Rs } 24,74,000} = 1.29 \text{ times}$	$\frac{\text{Rs } 30,00,000}{\text{Rs } 28,51,000} = 1.05 \text{ times}$
(iv) <i>Solvency Ratios (to show financial position)</i>		
(a) Debt-equity ratios		
(i) $\frac{\text{External funds}}{\text{Internal funds}}$	$\frac{\text{Rs } 12,42,000}{\text{Rs } 12,32,000} = 1.01 \text{ times}$	$\frac{\text{Rs } 13,09,000}{\text{Rs } 14,42,000} = 0.91 \text{ times}$
(ii) $\frac{\text{Long-term debts}}{\text{Internal funds}}$	$\frac{\text{Rs } 8,00,000}{\text{Rs } 12,32,000} = 0.65 \text{ times}$	$\frac{\text{Rs } 5,60,000}{\text{Rs } 14,42,000} = 0.39 \text{ times}$
(b) Interest coverage ratio	Not possible to determine	Not possible to determine

**Working Notes:**

1. Theoretically, activity ratios should have been determined by relating a particular category of asset (current or fixed) with cost of goods sold.

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2. In the absence of information of gross profit, GP ratio and debtors, cost of goods sold could not be determined.

ABC Ltd. is better placed than XYZ Ltd. in respect of liquidity, activity and solvency ratios, the primary factor being the accumulation of stocks with XYZ Ltd. It is reflected in its inventory turnover ratio which is only 3.71 times *vis-a-vis* 9.66 times of ABC Ltd. However, XYZ Ltd. has an edge over ABC Ltd. in respect of profitability ratios.

### Solution RQ.6.23

*Determination of debt service coverage ratio (amount in lakh of rupees)*

Year	EAT	Depreciation	Interest	Cash available (Col. 2 + 3 + 4)	Principal instalment	Debt obligations	DSCR (Col. 5 ÷ Col. 7)
1	2	3	4	5	6	7	8
1	20	20	19	59	11	30	1.97
2	35	20	17	72	18	35	2.06
3	40	20	15	75	18	33	2.27
4	20	20	12	52	18	30	1.73
5	18	20	10	48	18	28	1.71
6	18	20	7	45	8	15	3.00
7	16	20	5	41	8	13	3.15
8	16	20	2	38	8	10	3.80
Average DSCR ( $\Sigma \text{DSCR}/8$ ) = $19.69/8$ =							2.46

**Comment:** The DSCR of HIL is very satisfactory.



## CHAPTER 7

### Solution RQ.7.12

(a) Selling price of motor		Rs 230
Less variable costs		
Material	Rs 50	
Labour	80	
Variable overheads (0.75 × Rs 80)	60	
		190
Contribution margin per motor		40
BEP (motors) = Rs 2,40,000 ÷ Rs 40		6,000
(b) Desired sales volume (units) to have a profit of Rs 1,00,000 = (Rs 2,40,000 + Rs 1,00,000) ÷ Rs 40 = 8,500 motors		
(c) Revised selling price (Rs 230 – Rs 15)		Rs 215
Less total variable costs		190
Contribution margin per motor		25
BEP (motors) = Rs 2,40,000 ÷ Rs 25		9,600

### Solution RQ.7.13

Present level of profit: Rs 50 per cycle × 1,00,000 = Rs 50,00,000.

Fixed overheads = Rs 50 × 1,00,000 = Rs 50,00,000.

It is assumed that the Cycle Company Ltd. was absorbing the entire fixed overheads from 1 lakh cycles only.

*Revised Contribution Margin When Sales Price is Reduced*

	Situation (a)	Situation (b)
Sales price	Rs 180	Rs 160
Less variable costs per cycle	100	100
Contribution margin	80	60

Desired sales volume = (FC + Desired profit) ÷ Revised MC per unit

(a) Rs 1,00,00,000 ÷ Rs 80 = 1,25,000 cycles

(b) Rs 1,00,00,000 ÷ Rs 60 = 1,66,667 cycles

### Solution RQ.7.14

Pre-expansion BEP (amount) = [Rs 4,20,000 ÷ 0.575 (Rs 9.20 ÷ Rs 16) × 100]	Rs 7,30,435
BEP (in units) = (Rs 7,30,434.78 ÷ Rs 16)	45,653
Post-expansion BEP (amount) = [Rs 5,45,000 ÷ 0.60 (Rs 9.6 ÷ Rs 16) × 100]	9,08,333
BEP (in units) = (Rs 9,08,333 ÷ Rs 16)	56,771

*Comparative Income Statement (Pre-expansion and Post-expansion Programme) Assuming Sales Equal to Plant Capacity*

Particulars	Pre-expansion	Post-expansion
Production/sales (units)	80,000	1,20,000
Selling price	Rs 16	Rs 16
Sales revenue	Rs 12,80,000	Rs 19,20,000
Less variable costs	5,44,000	7,68,000
Contribution	7,36,000	11,52,000
Less fixed costs	4,20,000	5,45,000
Net income	3,16,000	6,07,000

As to which alternative is better, the answer hinges upon the sales volume. Simply on the basis of BEP, one may be tempted to conclude that since BEP is higher with expansion, the alternative of the *status-quo* is better. But this decision, in fact, may not be an optimal decision if the firm is able to increase its sales.

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The very fact that the firm is contemplating an increase in its plant capacity is a pointer to the inadequacy of the existing plant capacity to cater to the customers' demand. The alternative of expansion of plant capacity appears to be a better one.

### Solution RQ.7.15

(i) *Determination of Break-even Capacity of Merged Plant: 100 Per cent Capacity*

Particulars	A	B	C	Merged plant
Turnover (Rs lakh)	300	400	300	1,000
Less variable costs	200	300	150	650
Total contribution	100	100	150	350

Weighted  $C/V$  ratio = (Rs 350 lakh ÷ Rs 1,000 lakh) × 100 = 35 per cent

$BEP = [Rs\ 182\ (Rs\ 70 + Rs\ 50 + Rs\ 62)] \div 0.35 = Rs\ 520\ lakh.$

$BEP\ (\% \text{ capacity}) = (Rs\ 520\ lakh \div Rs\ 1,000\ lakh) \times 100 = 52\ \text{per cent}.$

(ii) *Profit at 75 per cent capacity of merged plant:* (Budgeted sales at 75 % capacity – Break-even sales revenue) ×  $C/V$  ratio = Rs 80.5 lakh (Rs 750 lakh – Rs 520 lakh) × 0.35

(iii) *Desired sales turnover to give profit of Rs 28 lakh* = (Rs 182 lakh + Rs 28 lakh) ÷ 0.35 = Rs 600 lakh

### Solution RQ.7.16

	Sales	Profit	Cost
1st half	Rs 2,70,000	Rs 7,200	Rs 2,62,800
2nd half	3,42,000	20,700	3,21,300

(i)  $P/V$  ratio =  $(\Delta \text{Profit} \div \Delta \text{Sales}) \times 100 = (Rs\ 13,500 \div Rs\ 72,000) \times 100 = 18.75\ \text{per cent}.$

(ii) *Profit When Sales are Rs 2,16,000*

	6 months	12 months
Sales revenue	Rs 2,16,000	Rs 2,16,000
Less variable cost [81.25% (100% – 18.75%)]	1,75,500	1,75,500
Contribution	40,500	40,500
Less fixed cost	43,425 <sup>@</sup>	86,850
Net profit (loss)	(2,925)	(46,350)

(iii) *Desired sales volume to earn a profit of Rs 36,000* = (Rs 86,850 + Rs 36,000) ÷ 0.1875 = Rs 6,55,200.

### Working Notes:

<sup>@</sup>*Determination of FC*

Rs 2,70,000 =  $FC + 81.25\% \times (Rs\ 2,70,000) + Rs\ 7,200$

Rs 2,70,000 =  $FC + Rs\ 2,19,375 + Rs\ 7,200$

Rs 2,70,000 – Rs 2,26,575 =  $FC$

Rs 43,425 =  $FC$  (for 6 months)

Rs 86,850 =  $FC$  (for 12 months).

## CHAPTER 8

### Solution RQ.8.12

(i) *Production Budget-Current Policy (July to October) (units)*

Month	Sales	Planned inventory		Desired production (Col. 2 + 3 - 4)
		Closing	Opening	
1	2	3	4	5
July	5,000	10,500	10,000	5,500
August	5,000	13,500	10,500	8,000
September	5,500	18,000	13,500	10,000
October	8,000	22,500	18,000	12,500
Total				36,000

(ii) The total production for four months is 36,000 units. The production manager wishes to produce an equal amount each month, so the required monthly production would be 9,000 units ( $36,000 \div 4$ ).

(iii) *Determination of Additional Carrying Cost Due to Additional Inventory.*

	July	August	September	October
Opening inventory	10,000	14,000	18,000	21,500
Add production	9,000	9,000	9,000	9,000
Total units available	19,000	23,000	27,000	30,500
Less sales	5,000	5,000	5,500	8,000
Ending inventory (revised policy)	14,000	18,000	21,500	22,500
Ending inventory (current policy)	10,500	13,500	18,000	22,500
Change in inventory (increase)	3,500	4,500	3,500	—
Total carrying cost at the rate of Re. 1 per unit	Rs 3,500	Rs 4,500	Rs 3,500	—
Increase in carrying cost = Rs 11,500				

### *Calculation of Savings in Production Cost Using Production Manager's Preference*

Production (units) for which additional costs are incurred:

September	—Current policy	10,000	
	—Revised policy	9,000	1,000
October	—Current policy	12,500	
	—Revised policy	9,000	3,500
Total			4,500
Saving in production cost from revised policy (4,500 units × Rs 2)			Rs 9,000
Net increase in costs (Rs 11,500 – Rs 9,000)			2,500

Production budget using the production manager's preference would give higher costs by Rs 2,500.

### Solution RQ.8.13

(i) *Production Budget (in units)*

Particulars	Quarters				Total
	I	II	III	IV	
Budgeted sales (units)	12,000	15,000	16,500	18,000	61,500
Add planned closing inventory (1/3 of the following quarters' sales)	5,000	5,500	6,000	6,500	23,000
Less opening inventory	(4,000)	(5,000)	(5,500)	(6,000)	(20,500)
Budgeted production	13,000	15,500	17,000	18,500	64,000

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Statement Showing Total Costs of Direct Material, Direct Labour, Variable Overheads and Fixed Overheads

Cost element	Quarters				Total
	I	II	III	IV	
Units to be produced	13,000	15,500	17,000	18,500	64,000
(a) Direct material costs					
Material quantity (lbs) @ 10 lbs per unit produced	1,30,000	1,55,000	1,70,000	1,85,000	6,40,000
(x) Price per lb	Re 0.50	Re 0.50	Re 0.50	Re 0.50	Re 0.50
	65,000	77,500	85,000	92,500	3,20,000
(b) Direct labour costs					
Labour hours required @ 1 hour 30 minutes per unit	19,500	23,250	25,500	27,750	96,000
(x) Labour cost @ Rs 4 per hour	4	4	4	4	4
	78,000	93,000	1,02,000	1,11,000	3,84,000
(c) Variable overheads costs					
Hours required @ 1 hour 30 minutes per unit	19,500	23,250	25,500	27,750	96,000
(x) Variable overheads rate of Re1 per hour	1	1	1	1	1
	19,500	23,250	25,500	27,750	96,000
(d) Fixed overheads costs [90,000 × Rs 2) ÷ 4 quarters] (assuming variable costing)	45,000	45,000	45,000	45,000	1,80,000
Total cost (a + b + c + d)	2,07,500	2,38,750	2,57,500	2,76,250	9,80,000

(ii) Budgeted Profit & Loss for the Coming Year

Particulars	Amount
Total sales revenue (Rs 17 × 61,500 units)	Rs 10,45,500
Less variable costs	
Direct material (Rs 5 × 61,500 units)	Rs 3,07,500
Direct labour (Rs 6 × 61,500 units)	3,69,000
Variable overheads (Rs 1.5 × 61,500 units)	92,250
Total contribution	2,76,750
Less fixed costs	1,80,000
Budgeted profit	96,750

(iii)  $BEP = Rs\ 1,80,000 \div Rs\ 4.5$  (Rs 17 – Rs 12.5) = 40,000 units

The company is expected to break-even in quarter III.

### Solution RQ.8.14

Flexible Budget

	Number of units produced						
	80,000	1,50,000	2,20,000	2,90,000	3,60,000	4,30,000	5,00,000
Selling price per unit	Rs 15	Rs 14	Rs 13	Rs 12	Rs 11	Rs 10	Rs 9
Total sales revenue							
(Number of units sold × Selling price per unit)	12,00,000	21,00,000	28,60,000	34,80,000	39,60,000	43,00,000	45,00,000
Less costs							
Variable costs	4,00,000	7,50,000	11,00,000	15,00,000	17,50,000	20,50,000	25,00,000
Fixed costs	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000	2,00,000

(Contd.)

(Contd.)

Semi-fixed costs	2,30,000	2,30,000	2,60,000	2,60,000	2,80,000	2,80,000	3,20,000
Budgeted income at various capacity levels	3,70,000	9,20,000	13,00,000	15,20,000	17,30,000	17,70,000	14,80,000

Thus, 4,30,000 is the desired volume which should be set for the budgeted output as the company has the maximum budgeted income (Rs 17,70,000).

**Solution RQ.8.15***Flexible Budget (Amount in lakh of rupees)*

Particulars	Percentage of capacity		
	70	85	100
Sales revenue	50.00	60.00	85.00
Less (a) variable expenses:			
Material	14.00	17.00	20.00
Labour	15.17	18.42	21.67
Other expenses	2.33	2.83	3.33
Total variable expenses	31.50	38.25	45.00
Less (b) semi-variable expenses:			
Maintenance and repairs	1.25	1.38	1.50
Indirect labour	5.00	5.50	6.00
Sales department salaries	1.50	1.65	1.80
Administrative salaries	1.25	1.37	1.50
Total semi-variable expenses	9.00	9.90	10.80
Less (c) fixed expenses:			
Wages and salaries	4.20	4.20	4.20
Rent, rates, and taxes	2.80	2.80	2.80
Depreciation	3.50	3.50	3.50
Sundry and other overheads	4.50	4.50	4.50
Total fixed expenses	15.00	15.00	15.00
(d) Total costs (a + b + c)	55.50	63.15	70.80
Budgeted profit (loss)	(5.50)	(3.15)	14.20

## CHAPTER 9

### ***Solution RQ.9.12***

#### *(i) Ranking of projects*

Year	CFAT			PV factor (at 0.10)	Total PV		
	A	B	C		A	B	C
1	Rs 50,000	Rs 80,000	Rs 1,00,000	0.909	Rs 45,450	Rs 72,720	Rs 90,900
2	50,000	80,000	1,00,000	0.826	41,300	66,080	82,600
3	50,000	80,000	10,000	0.751	37,550	60,080	7,510
4	50,000	30,000	—	0.683	34,150	20,490	—
5	1,90,000	—	—	0.621	1,17,990	—	—
	3,90,000	2,70,000	2,10,000		2,76,440	2,19,370	1,81,010

NPV (Gross present value – Cash outflows):

(A) (Rs 2,76,440 – Rs 2,00,000) = Rs 76,440

(B) (Rs 2,19,370 – Rs 2,00,000) = Rs 19,370

(C) (Rs 1,81,010 – Rs 2,00,000) = Rs (18,990)

Pay back period: Project A = 4 years

Project B = 2.5 years

Project C = 2 years

Internal rate of return (IRR):

	A	B	C
Fake pay back value	2.564	2.963	2.857
Factors closest to payback period (as per Table A-4)	2.532(0.28)	2.974(0.13)	2.829(0.03)
corresponding to the varying lives of the project	2.583(0.27)	2.914(0.14)	2.884(0.02)

*Project A:* In Project A, CFAT in the initial years are substantially smaller than the average CFAT; therefore, lower discount rates of 21 and 20 per cent are applied.

*Project A*

Year	CFAT	PV factor at		Total PV at	
		(0.21)	(0.20)	(0.21)	(0.20)
1	Rs 50,000	0.826	0.833	Rs 41,300	Rs 41,650
2	50,000	0.683	0.694	34,150	34,700
3	50,000	0.564	0.579	28,200	28,950
4	50,000	0.467	0.482	23,350	24,100
5	1,90,000	0.386	0.402	73,340	76,380
IRR <sub>(A)</sub> = 21 per cent				2,00,340	2,05,780

*Project B*

Year	CFAT	PV factor at		Total PV at	
		(0.14)	(0.15)	(0.14)	(0.15)
1	Rs 80,000	0.877	0.870	Rs 70,160	Rs 69,600
2	80,000	0.769	0.756	61,520	60,480
3	80,000	0.675	0.658	54,000	52,640
4	30,000	0.592	0.572	17,760	17,160
				2,03,440	1,99,880

IRR<sub>(B)</sub> = 15 per cent

*Project C*

Year	CFAT	PV factor (at 0.03)	Total PV
1	Rs 1,00,000	0.971	Rs 97,100
2	1,00,000	0.943	94,300
3	10,000	0.915	9,150
			<u>2,00,550</u>

$IRR_{(C)} = 3$  per cent

*Ranking of the projects*

Name of the method	A	B	C
PB	3	2	1
NPV	1	2	No rank
IRR	1	2	No rank

- (ii) The profitability index (PI) would be 1 if the IRR equalled the required return on investment. The significance of a PI less than 1 is that NPV is negative and the project should not be undertaken.
- (iii) Project A should be adopted because its NPV is the highest among all the projects.

**Solution RQ.9.13***Net cash outflows*

Cost of the new machine	Rs 1,50,000
Add net working capital required	30,000
Less sale value of the old machine	30,000
Less tax saving on the loss of the sale of old machine $[0.35 \times (\text{Rs } 50,000 - \text{Rs } 30,000)]$	<u>7,000</u>
	1,43,000

*Cash inflows*

Particulars	Amount before tax	Amount after tax
Increased sales revenue	Rs 40,000	
Less increased operating cost	<u>10,000</u>	
Increased net income	30,000	Rs 19,500
Tax savings on excess depreciation $[0.35 \times \text{Rs } 10,000$ $(\text{Rs } 15,000 - \text{Rs } 5,000)]$		<u>3,500</u>
(a) CFAT ( $t = 1 - 9$ )		<u>23,000</u>
(b) CFAT ( $t = 10$ )		
Operating:	23,000	
Add working capital	<u>30,000</u>	53,000

*Determination of NPV*

Year	CFAT	PV factor	Total PV
1-9	Rs 23,000	5.759	Rs 1,32,457
10	53,000	0.386	<u>20,458</u>
Total PV			1,52,915
Less cash outflows			<u>1,43,000</u>
NPV			9,915

The company should replace the existing machine.

**Solution RQ.9.14***Cash outflows*

Particulars	Machine X	Machine Y
Cost of the machine	Rs 80,000	Rs 1,15,000
Add installation cost	20,000	25,000
Add net working capital	10,000	20,000
Less cash inflows from the sale of the present machine	27,975*	27,975*
Net cash outflows	82,025	1,32,025

**Working Notes:**

\*Cash inflows from the sale of the present machine.

Book value of the machine (Rs 70,000 – Rs 30,000, accumulated depreciation)	Rs 40,000
Less sale value	25,000
Short-term capital loss on the sale of the machine	15,000
Tax savings on loss (0.35)	5,250
PV of Rs 25,000 to be received at (t = 1) = (Rs 25,000 x 0.909)	22,725
	27,975

*Cash inflows (t = 1 – 4)*

Particulars	Present machine	Machine X	Machine Y
Earning before depreciation and taxes	Rs 25,000	Rs 50,000	Rs 90,000
Less depreciation	10,000	25,000	35,000
Net earnings	15,000	25,000	55,000
Less Taxes	5,250	8,750	19,250
EAT	9,750	16,250	35,750
Add depreciation	10,000	25,000	35,000
CFAT	19,750	41,250	70,750
× PV factor	3.170	3.170	3.170
Total PV of CFAT	62,607	1,30,762	2,24,277
PV of the release of WC (PV factor = 0.683)	—	6,830	13,660
Total PV	62,607	1,37,592	2,37,937
Less cash outflows	—	82,025	1,32,025
NPV	62,607	55,567	1,05,912

The company should acquire machine Y. If the company has the proposal to buy machine X only, then it should continue with the existing machine.

**Solution RQ.9.15**

Economics of proposal A requiring Rs 2,50,000 more than proposal B

	Amount before tax	Amount after tax
<i>Cash inflows:</i>		
Cost savings Rs 50,000	Rs 32,500	
Differential depreciation		
Proposal A      Rs 62,500		
Proposal B      41,667	20,883	7,309
CFAT		39,809
PVIFA (15,12)		× 5.421

(Contd.)



*(Contd.)*

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Total present value	2,15,805
Less additional outlay	<u>2,50,000</u>
NPV	<u>(34,195)</u>

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Since the NPV is negative, equipment under proposal *B* should be accepted.

## CHAPTER 10

### ***Solution RQ.10.9***

*Equivalent annual cost (EAC)*

	Year	Machine X			Machine Y		
		Cost	PV factor	PV adjusted cost	Cost	PV factor	PV adjusted cost
Purchase cost	0	Rs 10,000	1.000	Rs 10,000	Rs 8,000	1.000	Rs 8,000
Operating cost	1	2,000	0.909	1,818	2,500	0.909	2,272.50
	2	2,000	0.826	1,652	2,500	0.826	2,065.00
	3	2,000	0.751	1,502	2,500	0.751	1,877.50
	4	2,500	0.683	1,707.50	3,800	0.683	2,595.40
	5	2,500	0.621	1,552.50	3,800	0.621	2,359.80
	6	2,500	0.564	1,410.00	3,800	0.564	2,143.20
	7	3,000	0.513	1,539.00	—	—	—
	8	3,000	0.467	1,401.00	—	—	—
	9	3,000	0.424	1,272.00	—	—	—
	10	3,000	0.386	1,158.00	—	—	—
Total cost				25,012.00			21,313.40
Less salvage value		1,500	0.386	579.00	1,000	0.564	564.00
				24,433.00			20,749.40
Divided by annuity PV factor for 10 per cent corresponding to the life of the project (capital recovery factor)				÷ 6.1446	÷ 4.3553		
Equivalent annual cost				3,976.50			4,764.20

Machine X would be cheaper to buy due to lower equivalent annual cost.

### ***Solution RQ.10.10***

*Equivalent annual cost*

	Year	PV factor	Petrol truck		Battery powered truck	
			(Costs) × (1 – tax rate)	PV adjusted costs	(Costs) × (1 – tax rate)	PV adjusted costs
Purchase cost	0	1.000	Rs 97,500	Rs 97,500	Rs 1,62,500	Rs 1,62,500
Operating cost	1	0.909	15,600	14,180	7,800	7,090
	2	0.826	22,100	18,255	7,800	6,443
	3	0.751	18,850	14,156	7,800	5,858
	4	0.683	20,150	13,762	7,800	5,327
	5	0.621	—	—	7,800	4,844
Total costs				1,57,853		1,92,062
Divided by annuity PV factor at 10% corresponding to the life of the project				÷ 3.17	÷ 3.79	
Equivalent annual cost				49,796		50,676

**Recommendation:** The company is advised to buy the petrol truck.

**Solution RQ.10.11**

(i) Determination of NPV of projects P and J

Year (t)	CFAT		PV factor at 0.15	Total PV	
	Project P	Project J		Project P	Project J
1	Rs 13,000	7,000	0.8696	Rs 11,304.8	Rs 6,087.2
2	8,000	13,000	0.7561	6,048.8	9,829.3
3	14,000	12,000	0.6575	9,205.0	
7.890.0					
4	12,000	—	0.5718	6,861.6	—
5	11,000	—	0.4972	5,469.2	—
6	15,000	—	0.4323	6,484.5	—
Gross present value				45,363.9	23,806.5
Less cash outflows				40,000.0	20,000.0
Net present value				5,363.9	3,806.5

(ii) Determination of IRR

Project P:  $\text{Rs } 40,000 = \text{Rs } 13,000/(1+r)^1 + \text{Rs } 8,000/(1+r)^2 + \text{Rs } 14,000/(1+r)^3 + \text{Rs } 12,000/(1+r)^4 + \text{Rs } 11,000/(1+r)^5 + \text{Rs } 15,000/(1+r)^6$

The fake pay back period is  $(\text{Rs } 40,000/\text{Rs } 12,167 \text{ Average CFAT}) = 3.287$ . From Table A-4, the value closest to the fake pay back of 3.287 against 6 years is 3.245 against 21 per cent. Since the actual cash flow stream in the year 2 is lower than the average CFAT, the IRR is likely to be marginally lower than 21 per cent. Let us try with 20 and 19 per cent.

Year	CFAT	PV factor		Total PV	
		(0.19)	(0.20)	(0.19)	(0.20)
1	Rs 13,000	0.840	0.833	Rs 10,920	10,829
2	8,000	0.706	0.694	5,648	5,552
3	14,000	0.593	0.579	8,302	8,106
4	12,000	0.499	0.482	5,988	5,784
5	11,000	0.419	0.402	4,609	4,422
6	15,000	0.352	0.335	5,280	5,025
Gross present value				40,747	39,718
Less cash outflows				40,000	40,000
Net present value				747	(282)

IRR is between 19 and 20 per cent. By interpolation IRR is 19 per cent +  $(\text{Rs } 747/\text{Rs } 1,029)$  i.e.,  $0.726 = 19.73$  per cent

Project J:  $\text{Rs } 20,000 = \text{Rs } 7,000/(1+r)^1 + \text{Rs } 13,000/(1+r)^2 + \text{Rs } 12,000/(1+r)^3$

The fake pay back period is  $(\text{Rs } 20,000/\text{Rs } 10,667 \text{ Average CFAT}) = 1.875$ . From Table A-4 the value closest to the fake pay back of 1.875 against 3 years is 1.896 against 27 per cent. Since the actual cash flows in the initial year is lower than the average CFAT, the IRR is likely to be lower than 27 per cent. Let us try at 25 and 26 per cent.

Year	CFAT	PV factor		Total PV	
		(0.25)	(0.26)	(0.25)	(0.26)
1	Rs 7,000	0.800	0.794	Rs 5,600	Rs 5,558
2	13,000	0.640	0.630	8,320	8,190
3	12,000	0.512	0.500	6,144	6,000

(Contd.)

(Contd.)

Gross present value	20,064	19,748
Less cash outflows	20,000	20,000
Net present value	64	(252)

IRR is 25 per cent + (Rs 64/Rs 316) i.e., = 0.2 = 25.2 per cent

- (iii) There is conflict in the ranking of projects between NPV and IRR methods. While project 'P' is ranked first under the NPV method, IRR ranks Project J first. The reason of conflict is due to reinvestment rate assumption. IRR method assumes that the intermediate CFAT are reinvested at IRR. With the NPV method, the assumption is that the funds released are reinvested at the rate of cost of capital. The assumption of the NPV method is considered to be superior (for details refer to text).
- (iv) In general, NPV ranking is preferred to that of IRR. The present situation is unequal project lives. In projects of unequal expected lives, the computation of equivalent annual net present value (EANPV) is appropriate. The EANPV is determined dividing the NPV of project by the annuity factor corresponding to the life of the project at the given cost of capital. The project with higher EANPV is preferred.

Determination of EANPV:

Project P = Rs 5,363.9/3.784 = Rs 1,417.52

Project J = Rs 3,806.5/2.283 = Rs 1,667.32

Since the EANPV of Project J is higher than that of project P, Project P is recommended.

### ***Solution RQ.10.12***

NPV from investments D, E and B is Rs 3,40,000, with Rs 3,20,000 utilized, leaving Rs 30,000 to be invested elsewhere. No other package of investments would yield NPV of Rs 3,40,000. It is true that the entire amount of capital is not utilised, but no firm would like to invest money only for the sake of it. Therefore, the company would be well advised to acquire D, E and B investments.

### ***Solution RQ.10.13***

#### **NPV Using Nominal Rate of Discount**

Year	CFAT	PV factor at 0.13	Total PV
1	Rs.6,00,000	0.885	Rs.5,31,000
2	7,00,000	0.783	5,48,100
3	8,00,000	0.693	5,54,400
4	5,00,000	0.613	3,06,500
5	4,00,000	0.543	2,17,200
Total present value			21,57,200
Less: Cash outflows			20,00,000
Net present value			1,57,200

The relationship between the nominal discount rate (n), the real discount rate (r) and inflation rate (i) is given by the following equation:

$$(1+n) = (1+r) (1+i)$$

or  $(1+r) = (1+n)/(1+i)$

Substituting the values,

$$(1+r) = 1.13/1.06 = 1.066$$

$$r = 0.066 \text{ or } 6.6 \text{ per cent.}$$

Since the discount rate now to be used is the real discount rate, the CFAT should also be adjusted for inflation so that they too are expressed in real terms. Therefore, CFAT are to be deflated by the inflation rate to arrive at the real CFAT.

**NPV Using Real Rate of Discount**

Year	CFAT	Deflation factor at 0.06	Real CFAT at 6.6%	PV factor	Total PV
1	Rs.6,00,000	$1/1.06 = 0.943$	Rs.5,65,800	0.938	Rs.5,30,720
2	7,00,000	$1/(1.06)^2 = 0.890$	6,23,000	0.880	5,48,240
3	8,00,000	$1/(1.06)^3 = 0.840$	6,72,000	0.826	5,55,072
4	5,00,000	$1/(1.06)^4 = 0.792$	3,96,000	0.774	3,06,504
5	4,00,000	$1/(1.06)^5 = 0.747$	2,98,800	0.726	2,16,929
Total present value					21,57,465
Less: Cash outflows					20,00,000
Net present value					1,57,465*

\* Difference in NPV of Rs.265 (Rs.1,57,465-Rs.1,57,200) between the two discount rates (nominal and real) is on account of rounding off the values. Both the approaches provide the same answer.

**Solution RQ.10.14**

The relationship between the nominal discount rate (n), the real discount rate (r) and inflation rate (i) is given by the following equation:

$$(1+n) = (1+r) (1+i)$$

Substituting the values,

$$(1+n) = 1.10 \times 1.08 = 1.188$$

$$r = 0.188 \text{ or } 18.8 \text{ per cent.}$$

**NPV Using Nominal Rate of Discount**

Year	CFAT	PV factor at 0.188	Total PV
1	Rs.8,00,000	0.842	Rs.6,73,600
2	10,00,000	0.709	7,09,000
3	7,00,000	0.596	4,17,200
4	5,00,000	0.502	2,51,000
Total present value			20,50,800
Less: Cash outflows			20,00,000
Net present value			50,800

## CHAPTER 11

### Solution RQ.11.15

- (i) Current expected market price of debenture ( $V_d$ ) = Interest on debenture/Current interest rate = Rs 120/0.15 = Rs 800.

Yes, I would buy the debenture for Rs 700.

$$(ii) \text{ Rs } 825 = \sum_{t=1}^8 \frac{\text{Rs } 120}{(1 + K_d)^t} + \frac{\text{Rs } 1000}{(1 + K_d)^8}$$

Using trial and error approach and discount rates of 15 and 16 per cent:

Years	Cash flow	PV factor at		Total PV at	
		0.15	0.16	0.15	0.16
1-8	Rs 120	4.487	4.344	Rs 538.44	Rs 521.28
8	1,000	0.327	0.305	327.00	305.00
				<u>865.44</u>	<u>826.28</u>

$K_d = 0.16$ . Thus, an investor would earn an effective yield of 16 per cent.

### Solution RQ.11.16

- (i)  $K_e = (D_1/P_0) + g = (\text{Rs } 2.10/\text{Rs } 20) + 0.05 = 15.5$  per cent.  
(ii) (a)  $\text{Rs } 2.16/0.155 - 0.08 = \text{Rs } 28.80$   
(b)  $\text{Rs } 2.06/0.155 - 0.03 = \text{Rs } 16.48$   
(iii)  $P_0 = \text{Rs } 2.40/0.155 - 0.20 = -\text{Rs } 53.33$

In situation (iii), the formula does not give the correct results as it is developed on the assumption that  $K_e > g$  while in the present situation,  $g > K_e$ .

### Solution RQ.11.17

- (i)  $K_d = [\text{Interest } (I)/\text{Sale value of debentures}] (1 - t) = [\text{Rs } 150/\text{Rs } 1,100] (1 - 0.35) = 8.9$  per cent.  
(ii)  $K_d = [I(1 - t) + (RV - SV)/N_m] \div (RV + SV)/2 = [\text{Rs } 280 (0.65) + (\text{Rs } 2,000 - \text{Rs } 1,900)/10] \div \text{Rs } 1,950 = 9.85$  per cent.  
(iii)  $K_p = D_p(1 + D_t) + (RV - SV)/N_m \div (RV + SV)/2 = [\text{Rs } 14 (1 + 0.1) + (\text{Rs } 105 - \text{Rs } 95)/10] \times 100 = 16.4$  per cent.  
(iv)  $K_e = D_1/P = \text{Rs } 6/50 = 12$  per cent  
(v)  $K_e = 0.12 + g = 0.12 + 0.05\% = 17$  per cent  
(vi)  $K_e = [E(1 - b)/P_0] + br = [(\text{Rs } 20 (1 - 0.5)/\text{Rs } 120)] + 0.5 \times 0.1 = 13.33$  per cent.

### Solution RQ.11.18

Determination of weighted average cost of capital

Sources of capital	Market value	Specific cost (K)	Total costs (MV × K)
Equity	Rs 7,50,000	0.18	Rs 1,35,000
Long-term debt	3,75,000	0.08	30,000
	<u>11,25,000</u>		<u>1,65,000</u>

$K_0 = (\text{Rs } 1,65,000/11,25,000) \times 100 = 14.7$  per cent.

### Solution RQ.11.19

Determination of cost of specific sources of capital:

$$K_e = [D_1/P_0(1 - f)] + g, \quad g = \text{Rs } 10.16 (1 + r)^5 = \text{Rs } 14.19.$$

Table A-1 suggests that Re 1 compounds to Rs 1.338 in 5 years at the compound rate of 6 per cent. Therefore,  $g$  is 6 per cent.

$$K_e = (\text{Rs } 15/\text{Rs } 120) + 0.06 = 18.5 \text{ per cent.}$$

$$K_r = (D_1/P_0) + g = (\text{Rs } 15/125) + 0.06 = 18 \text{ per cent.}$$

$$K_p = D_1/P_0(1-f) = \text{Rs } 15/105 = 14.3 \text{ per cent.}$$

$$K_d = [I(1-t) + (RV - SV)/n] \div (RV + SV)/2 = [\text{Rs } 15(0.65) + \text{Rs } 100 - 91.75]/11 \div (\text{Rs } 100 + \text{Rs } 91.75)/2 = 11 \text{ per cent}$$

\*Since yield on similar type of debentures is 16 per cent, the company would be required to offer debentures at discount.

$$\text{Market price of debentures} = \text{Coupon rate} \div \text{Market rate of interest} = \text{Rs } 15/0.16 = \text{Rs } 93.75.$$

$$\text{Sale proceeds from debentures} = \text{Rs } 93.75 - \text{Rs } 2, \text{ flotation cost} = \text{Rs } 91.75$$

*Cost of capital [BV weights and MV weights] (amount in lakh of rupees)*

Source of capital	Weights		Specific cost	Total cost	
	BV	MV		(BV $\times$ K)	(MV $\times$ K)
Equity	120	160*	0.185	22.2	29.6
Retained earnings	30	40*	0.18	5.4	7.2
Preference shares	9	10.4	0.143	1.29	1.49
Debentures	36	33.75	0.11	3.96	3.71
	195	244.15		32.85	42.00

\*MV of equity has been apportioned in the ratio of BV of equity and retained earnings.

$$K_0 \text{ (BV weights)} = (\text{Rs } 32.85/195) \times 100 = 16.85 \text{ per cent.}$$

$$K_0 \text{ (MV weights)} = (\text{Rs } 42/244.15) \times 100 = 17.20 \text{ per cent.}$$

## CHAPTER 12

### **Solution RQ.12.12**

*NPV under risk adjusted discount rate method*

Year	CFAT	PV factor (0.18)	Total PV
1-3	Rs 20,000	2.174 (Table A-4)	Rs 43,480
3	2,000	0.751 (Table A-3)	1,502
			<u>44,982</u>
Less cash outlays			<u>30,000</u>
NPV			14,982

Yes, the company should accept the proposal.

### **Solution RQ.12.13**

*NPV under CE method: project A*

Year	Expected CFAT	Certainty equivalent (CE)	Adjusted CFAT	PV factor (0.06)	Total PV
0	Rs (25,000)	1.0	Rs (25,000)	1.000	Rs (25,000)
1	15,000	0.8	12,000	0.943	11,316
2	15,000	0.7	10,500	0.890	9,345
3	15,000	0.6	9,000	0.840	7,560
4	15,000	0.5	7,500	0.792	5,940
Total NPV <sub>A</sub>					<u>9,161</u>

*NPV under CE method: project B*

Year	Expected CFAT	(CE)	Adjusted CFAT	PV factor (0.06)	Total PV
0	Rs (25,000)	1.0	Rs (25,000)	1.000	Rs (25,000)
1	9,000	0.9	8,100	0.943	7,638
2	18,000	0.8	14,400	0.890	12,816
3	12,000	0.7	8,400	0.840	7,056
4	16,000	0.4	6,400	0.792	5,069
Total NPV <sub>B</sub>					<u>7,579</u>

The company should take up Project A.

### **Solution RQ.12.14**

*Computation of net present value*

Cash flow estimates	CFAT ( $t = 1 - 12$ )	PV factor (0.14)	Total PV	Cash outlays	NPV
<b>Machine A</b>					
Pessimistic	Rs 8,000	5.660	Rs 45,280	Rs 50,000	Rs(4,720)
Most likely	12,000	5.660	67,920	50,000	17,920
Optimistic	16,000	5.660	90,560	50,000	40,560
<b>Machine B</b>					
Pessimistic	Nil	5.660	Nil	50,000	(50,000)
Most likely	10,000	5.660	56,660	50,000	6,660
Optimistic	20,000	5.660	1,13,200	50,000	63,200

Project B is more risky because the NPV can be negative as high as Rs 50,000, while in Project A, the NPV can be negative only by Rs 4,720.



**Solution RQ.12.15**(i) *Determination of expected NPV*

Year 1			Year 2			Year 3		
CF	$P_j$	$CF \times P_j$	CF	$P_j$	$CF \times P_j$	CF	$P_j$	$CF \times P_j$
Rs 15,000	0.2	Rs 3,000	Rs 20,000	0.5	Rs 10,000	Rs 25,000	0.1	Rs 2,500
20,000	0.4	8,000	23,000	0.1	2,300	30,000	0.3	9,000
25,000	0.3	7,500	25,000	0.2	5,000	35,000	0.3	10,500
30,000	0.1	3,000	28,000	0.2	5,600	50,000	0.3	15,000
$(\overline{CF}_1)$		= 21,500	$(\overline{CF}_2)$		= 22,900	$(\overline{CF}_3)$		= 37,000
PV factor (0.05)0.952			0.907			0.864		
PV		20,468			20,770			31,968
Total PV								73,206
Less cash outflows								50,000
NPV (expected)								23,206

(ii) *Period 1*

$$\begin{aligned}
 \frac{(CF_{j1} - \overline{CF}_1)^2 \times P_{j1}}{\text{Rs } 4,22,50,000 \quad 0.2} &= \frac{(CF_{j1} - \overline{CF}_1)^2 P_{j1}}{\text{Rs } 84,50,000} \\
 22,50,000 \quad 0.4 &= 9,00,000 \\
 1,22,50,000 \quad 0.3 &= 36,75,000 \\
 7,22,50,000 \quad 0.1 &= 72,25,000 \\
 \frac{(CF_{j1} - \overline{CF}_1)^2 P_{j1}}{} &= 2,02,50,000 \\
 &= \sqrt{2,02,50,000} = 4,500
 \end{aligned}$$

*Period 2*

$$\begin{aligned}
 \frac{(CF_{j2} - \overline{CF}_2)^2 \times P_{j2}}{84,10,000 \quad 0.5} &= \frac{(CF_{j2} - \overline{CF}_2)^2 P_{j2}}{42,05,000} \\
 10,000 \quad 0.1 &= 1,000 \\
 44,10,000 \quad 0.2 &= 8,82,000 \\
 2,60,10,000 \quad 0.2 &= 52,02,000 \\
 \frac{(CF_{j2} - \overline{CF}_2)^2 P_{j2}}{} &= 1,02,90,000 \\
 &= \sqrt{1,02,90,000} = 3,208
 \end{aligned}$$

*Period 3*

$$\begin{aligned}
 \frac{(CF_{j3} - \overline{CF}_3)^2 \times P_{j3}}{14,40,00,000 \quad 0.1} &= \frac{(CF_{j3} - \overline{CF}_3)^2 P_{j3}}{1,44,00,000} \\
 4,90,00,000 \quad 0.3 &= 1,47,00,000 \\
 40,00,000 \quad 0.3 &= 12,00,000 \\
 16,90,00,000 \quad 0.3 &= 5,07,00,000 \\
 \frac{(CF_{j3} - \overline{CF}_3)^2 \times P_{j3}}{} &= 8,10,00,000 \\
 &= \sqrt{8,10,00,000} = 9,000
 \end{aligned}$$

*Standard deviation about the expected value*

$$= \sqrt{\frac{(4,500)^2}{(1 + 0.05)^2} + \frac{(3,208)^2}{(1 + 0.05)^4} + \frac{(9,000)^2}{(1 + 0.05)^6}}$$

$$\begin{aligned}
&= \sqrt{\frac{2,02,50,000}{1.102} + \frac{102,91,264}{1.216} + \frac{8,10,00,000}{1.340}} \\
&= \sqrt{1,83,75,681 + 84,63,211 + 6,04,47,761} \\
&= \sqrt{8,72,86,653} = 9,343
\end{aligned}$$

(iii) (a) Probability of the NPV less than zero

$$Z = \frac{0 - NPV}{r} = \frac{0 - 23,206}{9,343} = -2.484$$

According to Table Z, the probability of the NPV being zero is 0.4934. Therefore, the probability of the NPV being less than zero would be  $0.5 - 0.4934 = 0.0066$  or 0.66 per cent.

(b) Greater than zero

$$1 - 0.0066 = 0.9934 \quad \text{or} \quad 99.34 \text{ per cent.}$$

(c) Profitability index will be 1 when NPV is zero; it will be less than 1 if the NPV is negative. Therefore, the probability of the profitability index being zero or less would be the same as that of NPV being zero or less, that is, 0.66 per cent.

(d) At least equal to mean

$$Z = (\text{Rs } 23,206 - \text{Rs } 23,206)/9,343 = 0.0$$

Reading from the normal distribution Table Z, we get the probability corresponding to 0.0 as 0.5. Therefore, the probability of having NPV at least equal to mean would be equivalent to the area to the right of the curve, that is,  $0.5 = 50$  per cent.

(e) 10 per cent below mean

$$Z = (\text{Rs } 20,885.40 - \text{Rs } 23,206)/9,343 = -0.2483$$

The area as per Table Z corresponding to 0.25 is 0.0987. In other words, there is 9.87 per cent probability of NPV being less than 10 per cent of the value of mean.

(f) 10 per cent above mean

The same as (e), that is, 9.87 per cent.

### Solution RQ.12.16

(i) Decision tree

Time 0	1	2	CFAT <sub>2</sub>	NPV at 10%	Joint probability	Expected NPV	
<div>Equipment cost (Rs 40,000)</div>	0.4	0.2	Rs 12,000	(Rs 7,363)	0.08	Rs (589.04)	
		CFAT	0.3	16,000	(4,059)	0.12	(487.08)
		Rs 25,000	0.5	22,000	897	0.20	179.40
	0.6	0.4	20,000	3,790	0.24	909.60	
		0.5	25,000	7,920	0.30	2,376.00	
		Rs 30,000	0.1	30,000	12,050	0.06	723.00
		NPV					3,111.88

- (ii) If the worst outcome is realised, the NPV of the project would be (Rs 7,363).
- (iii) If the best outcome, the NPV of the project would be Rs 12,050. There is a 6 per cent probability of this outcome.
- (iv) Yes, the project, should be accepted, because the project is expected to yield a positive NPV of Rs 3,111.88.

## CHAPTER 13

### **Solution RQ.13.8**

The cost would be the same under both the plans. Preference should be given to a plan involving long-term financing. The cost would be Rs 8,000 ( $\text{Rs } 1,00,000 \times 0.08$ ).

### **Solution RQ.13.9**

Estimated total funds requirements of Hypothetical Ltd for the year (amount in lakh of rupees)

Month	Hedging approach			Trade-off approach	
	Total funds	Permanent	Seasonal	Total	Seasonal
January	30	20	10	110	0
February	30	20	10	110	0
March	40	20	20	110	0
April	60	20	40	110	0
May	100	20	80	110	0
June	150	20	130	110	40
July	200	20	180	110	90
August	180	20	160	110	70
September	110	20	90	110	0
October	70	20	50	110	0
November	40	20	20	110	0
December	20	20	0	110	0
			790		200

#### (i) Cost of financing under hedging approach

Average annual short-term loan =  $(\text{Rs } 790 \div 12) = \text{Rs } 65.83 \text{ lakh}$

(a) Cost of short-term funds ( $\text{Rs } 65.83 \text{ lakh} \times 0.04$ )	Rs 2.63 lakh
(b) Cost of long-term funds ( $\text{Rs } 20 \text{ lakh} \times 0.10$ )	2.00
Total costs	4.63

#### (ii) Cost of financing under conservative approach

(Annual average loan  $\times$  Long-term rate of interest) =  $200 \text{ lakh} \times 0.10 = \text{Rs } 20 \text{ lakh}$

(iii) Requirements of funds under the trade-off plan would be an average of maximum funds requirements and minimum funds requirements, that is,  $(\text{Rs } 200 \text{ lakh} + \text{Rs } 20 \text{ lakh})/2 = \text{Rs } 110 \text{ lakh}$ .

(1) Cost of long-term funds ( $\text{Rs } 110 \text{ lakh} \times 0.10$ )	11
(2) Cost of short-term funds ( $\text{Rs } 200 \text{ lakh}/12 \times 0.04$ )	0.67
Total cost	11.67

### **Solution RQ.13.10**

Statement showing determination of working capital

(A) Current assets	
(i) Stock of raw materials ( $1,56,000 \times \text{Rs } 90 \times 1/12$ )	Rs 11,70,000
(ii) Work-in-process	
(a) Material $[(1,56,000 \times \text{Rs } 90 \times 4) \times 0.50]/48$	Rs 5,85,000
(b) Labour $[(1,56,000 \times \text{Rs } 40 \times 4) \times 0.50]/48$	2,60,000

(Contd.)

(Contd.)

(c) Overheads $[(1,56,000 \times \text{Rs } 75 \times 4) \times 0.50]/48$	4,87,500	13,32,500
(iii) Finished goods stock $(1,56,000 \times \text{Rs } 205 \times 1)/12$		26,65,000
(iv) Debtors $(1,24,800 \times \text{Rs } 205 \times 2)/12$		42,64,000
(v) Cash in hand and at bank		60,000
Total		94,91,500
(B) Current liabilities		
(i) Creditors $(1,56,000 \times \text{Rs } 90 \times 1)/12$		11,70,000
(ii) Time lag in payment of wages $(1,56,000 \times \text{Rs } 75 \times 1.5)/48$		1,95,000
(iii) Time lag in payment of overheads $(1,56,000 \times \text{Rs } 75 \times 1)/12$		9,75,000
Total		23,40,000
(C) NWC (A – B)		71,51,500

**Solution RQ.13.11**

Projected statement to determine net working capital of MA Ltd for year 1 and 2

	Year 1	Year 2
Current assets:		
(i) Stock of raw materials:		
(6,000 units $\times$ Rs 40 $\times$ 2.25/12) for year 1	Rs 45,000	
(9,000 units $\times$ Rs 40 $\times$ 2.25/12) for year 2		Rs 67,500
(ii) Finished goods:	80,000*	1,11,000**
<i>Cash cost of production</i>	<i>Year 1</i>	<i>Year 2</i>
Materials @ Rs 40 per unit	Rs 2,40,000	Rs 3,60,000
Direct labour and variable expenses @ Rs 20 per unit	1,20,000	1,80,000
Fixed manufacturing expenses (12,000 units $\times$ Rs 6)	72,000	72,000
Fixed administrative expenses (12,000 units $\times$ Rs 4)	48,000	48,000
Current cost (cash)	4,80,000	6,60,000
Add opening stock at average cost (of Rs 80 per unit)	—	80,000
Less closing stock at average cost		
Year 1 (Rs 4,80,000/6,000 units) $\times$ 1,000 units	80,000*	
Year 2 (Rs 7,40,000/10,000 units) $\times$ 1,500 units		1,11,000**
Cost of goods sold (cash)	4,00,000	6,29,000
(iii) Debtors:		
Year 1 (Rs 4,32,000/12)	36,000	
Year 2 (Rs 6,75,000/12)		56,250
Cost of goods sold (cash)	Rs 4,00,000	Rs 6,29,000
Add variable expenses @ Rs 4 per unit sold	20,000	34,000
Add total fixed selling expenses (Rs 12,000 $\times$ Rs. 1)	12,000	12,000
Cost of sales (cash)	4,32,000	6,75,000

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Minimum desired cash balance		10,000	10,000
Total		<u>1,71,000</u>	<u>2,44,750</u>
<i>Current liabilities:</i>			
(i) Creditors for supply of materials:			
Year 1 (Rs 2,85,000/12)		23,750	
Year 2 (Rs 3,82,500/12)			31,875
<i>Materials purchased</i>			
Materials consumed	Rs 2,40,000	Rs 3,60,000	
Add closing stock (equivalent to 2.25 month's average consumption)	45,000	67,500	
Less opening stock	—	(45,000)	
Purchases	<u>2,85,000</u>	<u>3,82,500</u>	
(ii) Creditors for expenses:			
Year 1 (Rs 2,72,000/12)		22,667	
Year 2 (Rs 3,46,000/12)			28,833
Direct labour and variable expenses	Rs 1,20,000	Rs 1,80,000	
Fixed manufacturing expenses	72,000	72,000	
Fixed administrative expenses	48,000	48,000	
Selling (fixed and variable)	<u>32,000</u>	<u>46,000</u>	
	2,72,000	3,46,000	
Total		<u>46,417</u>	<u>60,708</u>
NWC		<u>1,24,583</u>	<u>1,84,042</u>

**Note:** Working capital is required in respect of full amount of fixed overheads.

#### **Solution RQ.13.12**

*Statement showing determination of working capital*

	Amount (Rs in lakh)
<i>Current assets:</i>	
Cash balance	20.00
Raw material (Rs 450 lakh $\times$ 1/12)	37.50
Finished goods (Rs 1,470 <sup>1</sup> lakh $\times$ 1/12)	122.50
Debtors	
Domestic market (Rs 1,200 lakh $\times$ 0.75 $\times$ 1/12)	75.00
Export market (Rs 600 lakh <sup>2</sup> $\times$ 0.75 $\times$ 3/12)	112.50
Sales promotion expenses (Rs 60 lakh $\times$ 3/12)	15.00
Total	<u>382.50</u>
<i>Current liabilities:</i>	
Raw materials (Rs 450 lakh $\times$ 2/12)	75.00
Wages ((Rs 360 lakh $\times$ 1/24)	15.00
Manufacturing expenses (Rs 540 lakh $\times$ 1/12)	45.00
Administrative expenses (Rs 120 lakh $\times$ 1/12)	10.00
Total	<u>145.00</u>
Net working capital	<u>237.50</u>

<sup>1</sup>Cost of production:

Materials used	Rs 450 lakh
Wages paid	360
Manufacturing expenses (cash)	540
Administrative expenses	120
	<u>1,470</u>

2. Rs 540 lakh/0.90 = Rs 600 lakh.

**Note:** Tax aspect is ignored as it is to be paid out of profits.

## CHAPTER 14

### ***Solution RQ.14.12***

*Cash budget from July to December*

Particulars	July	August	September	October	November	December
<b>Cash inflows:</b>						
<b>Collection from debtors</b>						
Within the month of sale (0.05)	Rs 7,500	Rs 11,250	Rs 15,000	Rs 7,500	Rs 7,500	Rs 6,875
First month following sales (0.8)	60,000	1,20,000	1,80,000	2,40,000	1,20,000	1,20,000
Second month following sales (0.15)	11,250	11,250	22,500	33,750	45,000	22,500
<b>Total</b>	<b>78,750</b>	<b>1,42,500</b>	<b>2,17,500</b>	<b>2,81,250</b>	<b>1,72,500</b>	<b>1,49,375</b>
<b>Cash outflows:</b>						
Payment for raw materials	37,500	52,500	3,67,500	1,27,500	97,500	67,500
Salary (general and administrative)	11,250	11,250	11,250	11,250	11,250	11,250
Lease payment	3,750	3,750	3,750	3,750	3,750	3,750
Miscellaneous expenses	1,150	1,150	1,150	1,150	1,150	1,150
Income tax	—	—	26,250	—	—	26,250
Research	—	—	—	75,000	—	—
<b>Total</b>	<b>53,650</b>	<b>68,650</b>	<b>4,09,900</b>	<b>2,18,650</b>	<b>1,13,650</b>	<b>1,09,900</b>
Surplus (deficiency)	25,100	73,850	(1,92,400)	62,600	58,850	39,475
Beginning balance	55,000	80,100	1,53,950	37,500	37,500	45,500
Ending balance (deficiency)	80,100	1,53,950	(38,450)	1,00,100	96,350	84,975
Minimum cash balance	37,500	37,500	37,500	37,500	37,500	37,500
Excess cash balance	42,600	1,16,450	—	62,600	58,850	47,475
Borrowings required	—	—	75,950	—	—	—
Repayments made	—	—	—	62,600	13,350	—
Closing balance (actually now estimated)	80,100	1,53,950	37,500	37,500	45,500	84,975

### ***Solution RQ.14.13***

*Cash budget of XYZ Ltd from April to September (figures are in thousands of rupees)*

Particulars	January	February	March	April	May	June	July	August	September
<b>Total sales</b>	<b>1,200</b>	<b>1,400</b>	<b>1,600</b>	<b>600</b>	<b>800</b>	<b>800</b>	<b>1,200</b>	<b>1,000</b>	<b>800</b>
Cash sales (0.25)	300	350	400	150	200	200	300	250	200
Credit sales (0.75)	900	1,050	1,200	450	600	600	900	750	600
<b>Cash inflows:</b>									
Cash sales				150	200	200	300	250	200
<b>Collection from debtors:</b>									
In the month following sales (0.60)				720	270	360	360	540	450
In the 3rd month from sales (0.30)				315	360	135	180	180	270
In the 4th month from sales (0.10)				90	105	120	45	60	60
<b>Total</b>				<b>1,275</b>	<b>935</b>	<b>815</b>	<b>885</b>	<b>1,030</b>	<b>980</b>
<b>Cash outflows:</b>									
Purchases (paid in the same month)				640	640	960	800	640	960
Wages and salaries (paid in the same month)				120	160	200	200	160	140
Interest (Rs 20 lakh $\times$ 0.06 $\times$ 3/12)				—	—	30	—	—	30
Excise duty				—	—	—	200	—	—

(Contd.)



(Contd.)

Plant and machinery	—	—	—	—	—	120
Rent	8	8	8	8	8	8
Total	<u>768</u>	<u>808</u>	<u>1,198</u>	<u>1,208</u>	<u>808</u>	<u>1,258</u>
Surplus (deficiency)	507	127	(383)	(323)	222	(278)
Beginning cash balance	<u>400</u>	<u>907</u>	<u>1,034</u>	<u>651</u>	<u>400</u>	<u>550</u>
Closing cash balance	907	1,034	651	328	622	272
Proposed borrowings (repayment)	—	—	—	72	(72)	128
Ending balance (actually now estimated)	<u>907</u>	<u>1,034</u>	<u>651</u>	<u>400</u>	<u>550</u>	<u>400</u>

**Solution RQ.14.14**

- (i) (a) Cash cycle: 80 days + 100 days – 60 days = 120 days  
 (b) Cash turnover =  $360 \div 120 \text{ days} = 3$   
 (ii) Minimum operating cash = Total operating annual outlay/Cash turnover = Rs 1,81,20,000  $\div 3$  = Rs 60,40,000  
 (iii) Cash cycle = 120 days – 10 days = 110 days  
 Cash turnover =  $360/110 = 3.273$   
 Minimum operating cash = Rs 1,81,20,000/3.273 = Rs 55,36,713  
 Reduction in investment = (Rs 60,40,000 – Rs 55,36,713) = Rs 5,03,287  
 Savings =  $0.08 \times \text{Rs } 5,03,287 = \text{Rs } 40,263$ .

**Solution RQ.14.15**

- (i) Cash released by the concentration banking system = Rs 40,00,000  $\times 2 \text{ days} = \text{Rs } 80,00,000$ .  
 (ii) Savings =  $0.08 \times \text{Rs } 80,00,000 = \text{Rs } 6,40,000$ .  
 The firm should institute concentration banking system. It costs only Rs 75,000 while the expected savings are Rs 6,40,000.  
 (iii) Cash released by the lock-box system = Rs 40,00,000  $\times 4 \text{ days} = \text{Rs } 1,60,00,000$ .  
 (iv) Savings in lock-box system:  $0.08 \times \text{Rs } 1,60,00,000 = \text{Rs } 12,80,000$ .  
 (v) Lock-box system is better. Its net savings, Rs 11,60,000 (Rs 12,80,000 – Rs 1,20,000) are higher *vis-a-vis* of concentration banking.

**Solution RQ.14.16**

- (i) Cash cycle =  $360 \text{ days}/4.5 = 80 \text{ days}$  (present). Cash cycle, when accounts payables can be stretched by 20 days, would be 60 days. Cash turnover would be 6.  
 Minimum operating cash requirement:  
 (a) Current = Rs 1,75,000/4.5 = Rs 38,889  
 (a) Proposed = Rs 1,75,000/6 = Rs 29,166  
 (ii) Reduction in investment: (Rs 38,889 – 29,166) = Rs 9,723  
 Savings in cost =  $0.08 \times \text{Rs } 9,723 = \text{Rs } 777.84$ .

## CHAPTER 15

### **Solution RQ.15.6**

- (i) Average investment in accounts receivable = [Cost of goods sold (Number of units sold  $\times$  variable cost, VC per unit) + Total fixed cost (TFC)]/Debtors turnover

Present plan = [(32,000  $\times$  Rs 12) + Rs 1,60,000]/6 (360 days  $\div$  60 days) = Rs 90,667

Proposed plan = [(40,000  $\times$  Rs 12) + Rs 1,60,000]/5 (360 days  $\div$  72 days) = Rs 1,28,000

\*Total fixed costs: = [(Rs 17 (total cost) – Rs 12 (VC)]  $\times$  Number of units sold, Rs 5  $\times$  32,000 = Rs 1,60,000

- (ii) Average cost per unit (proposed plan) = Rs 6,40,000/40,000 units (Rs 10,00,000  $\div$  Rs 25) = Rs 16.

- (iii) Marginal investments in receivables = Rs 1,28,000 – Rs 90,667 = Rs 37,333

- (iv) Cost of marginal investments = 0.15  $\times$  Rs 37,333 = Rs 5,600.

### **Solution RQ.15.7**

*Incremental analysis (tightening credit standards or not)*

	<i>Present plan</i> <i>(80,000 units)</i>	<i>Proposed plan</i> <i>(70,000 units)</i>	<i>Differential revenues</i> <i>and costs (decrease)</i>
Sales revenue	Rs 32,00,000	Rs 28,00,000	Rs (4,00,000)
Less: variable costs @ Rs 25 per unit	20,00,000	17,50,000	(2,50,000)
fixed costs	5,60,000	5,60,000	—
investment cost (working notes)	1,02,400	57,750	(44,650)
Savings (deficiency)	5,37,600	4,32,250	(1,05,350)

**Recommendation:** The firm should not adopt more strict credit collection policy, as it will decrease profits by Rs 1,05,350.

### **Working Notes:**

*Investments in accounts receivable:*

Present plan: = [(80,000 units  $\times$  Rs 25 (VC) + TFC (Rs 7  $\times$  80,000)]/5 (360 days  $\div$  72 days) = Rs 5,12,000

Proposed plan: [(70,000 units  $\times$  Rs 25) + Rs 5,60,000]/8 (360 days  $\div$  45 days) = Rs 2,88,750

*Cost of investment:*

Present plan : Rs 5,12,000  $\times$  0.20 = Rs 1,02,400

Proposed plan : 2,88,750  $\times$  0.20 = Rs 57,750

### **Solution RQ.15.8**

*Incremental analysis (relaxation in credit terms or not)*

	<i>Present plan</i> <i>(20,000 units)</i>	<i>Proposed plan</i> <i>(22,000 units)</i>	<i>Differential costs</i> <i>and revenues</i>
Sales revenue	Rs 20,00,000	Rs 22,00,000	Rs 2,00,000
Less: variable cost	17,60,000	19,36,000	1,76,000
fixed costs (20,000 units $\times$ 4)	80,000	80,000	
investment cost (working notes)	27,600	50,400	22,800
Income (deficiency)	1,32,400	1,33,600	1,200

**Recommendation:** The firm should relax its credit policy as it increases profit by Rs 1,200.

### **Working Notes:**

*Cost of investments in accounts receivable:*

Present plan: Rs 18,40,000/10 (360 days  $\div$  36 days)

Rs 1,84,000

Cost = (0.15  $\times$  Rs 1,84,000)

27,600

Proposed plan = Rs 20,16,000/6 ( 360 days × 60 days)	3,36,000
Cost = (0.15 × Rs 3,36,000)	50,400

**Solution RQ.15.9***Incremental analysis (relaxation in credit terms or not)*

Particulars	Amount
Increase in sales revenue (Rs 2,56,48,750 × 10%)	Rs 25,64,875
Less incremental costs:	
Variable operating costs (Rs 25,64,875 × 0.72)	18,46,710
Bad debts expected (Rs 2,82,13,625 × 0.02)	Rs 5,64,273
Less existing bad debts (Rs 2,56,48,750 × 0.02)	<u>3,84,731</u>
Operating profits before taxes	<u>5,38,623</u>
Less taxes	<u>1,88,518</u>
Operating profits after taxes	<u>3,50,105</u>
Additional investment in debtors	10,77,247*
Expected rate of return (Rs 3,50,105/Rs 10,77,247) = 32.5%	

**\* Additional investment in debtors:**

Present plan: (Rs 2,56,48,750 × 0.72 = Rs 1,84,67,100)/Debtors turnover, 8 = Rs 23,08,388

Proposed plan: (Rs 2,82,13,625 × 0.72 = Rs 2,03,13,810)/Debtors turnover, 6 = Rs 33,85,635

Additional investment in debtors = Rs 33,85,635 – Rs 23,08,388 = Rs 10,77,247

**Assumption:** Investment in debtors are computed at cost price.**Recommendation:** The firm is advised to relax its credit terms as the expected rate of return on additional investment in debtors is 32.5 per cent *vis-a-vis* required after-tax return of 15 per cent on investments.

## CHAPTER 16

### ***Solution RQ.16.8***

*ABC analysis*

Item	Units	Per cent of total	Unit cost	Total cost	Per cent of total	Classification
11	1,800	5.02	Rs 2.5	Rs 45,000	21.27	A
13	4,400	12.29	9.5	41,800	19.75	
4	2,000	5.58	16.8	33,600	15.88	
18	2,400	6.7	10	24,000	11.34	
7	160	0.44	76	12,160	5.75	B
8	3,000	8.37	3	9,000	4.25	
14	3,200	8.93	2.6	8,320	3.93	
1	4,000	11.17	1.96	7,840	3.71	
17	3,400	9.49	2.2	7,480	3.53	
15	1,920	5.36	2	3,840	1.81	
5	20	0.05	165	3,300	1.56	C
10	6,000	16.76	0.5	3,000	1.42	
19	120	0.33	21	2,520	1.19	
9	1,200	3.35	1.9	2,280	1.08	
2	200	0.56	10	2,000	0.94	
6	300	0.83	6	1,800	0.85	
20	320	0.89	4	1,280	0.60	
3	440	1.23	2.4	1,056	0.50	
16	800	2.23	1.2	960	0.45	
12	130	0.36	2.7	351	0.16	
Total	35,810	100		2,11,587	100	

### ***Solution RQ.16.9***

*(i) Computation of expected stock-out costs*

Safety stock level	Stock-out (units)	Stock-out costs (Rs 50 per unit )	Probability of stock-out	Expected stock-out cost at this level	Total expected stock-out costs
800	0	0	0	0	0
600	200	Rs 10,000	0.04	Rs 400	Rs 400
400	400	20,000	0.04	800	
	200	10,000	0.06	600	1,400
200	600	30,000	0.04	1,200	
	400	20,000	0.06	1,200	3,400
	200	10,000	0.10	1,000	
0	800	40,000	0.04	1,600	
	600	30,000	0.06	1,800	
	400	20,000	0.10	2,000	7,400
	200	10,000	0.20	2,000	

## (ii) Computation of total safety costs

Safety stock (units)	Expected stock- out costs	Carrying cost (Rs 19 per unit)	Total safety stock cost
0	Rs 7,400	0	Rs 7,400
200	3,400	Rs 3,800	7,200
400	1,400	7,600	9,000
600	400	11,400	11,800
800	0	15,200	15,200

(i) The safety stock should be 800 units if the firm never wishes to miss a sale. The total cost associated with this level of safety stock is Rs 15,200.

(ii) The optimal safety stock is 200 units.

**Solution RQ.16.10**

$$\begin{aligned}\text{EOQ} &= \sqrt{\frac{2AB}{C}} \\ &= \sqrt{(2 \times 12,00,000 \times 50)/0.30} = \sqrt{40,00,000} = 20,000 \text{ units}\end{aligned}$$

**Working notes**

Total carrying cost =  $0.10 \times (12,00,000 \times \text{Rs } 3) = \text{Rs } 3,60,000$

Carrying cost per unit =  $\text{Rs } 3,60,000 \div 12,00,000 = \text{Rs } 0.30$

**Solution RQ.16.11**

$$\begin{aligned}\text{(i) EOQ (in gross lots)} &= \sqrt{(2 \times 36 \times 30)/112} \\ &= \sqrt{19.28} = 4.4 \text{ or } 4 \text{ gross (as purchases are allowed in gross lots). The figure is not revised upward (as is normally done to 5) as it will require 7.2 orders (36} \div 5\text{).}\end{aligned}$$

**Working notes**

B = Cost of placing an order	Rs 10
Plus cost of receiving an order	20
Total buying cost per order	30
C = List price per gross	800
Less 40 per cent trade discount	320
Net price	480
Plus freight cost per gross	20
Plus insurance and taxes ( $0.12 \times \text{Rs } 500$ )	60
Effective purchase price per gross	560
Carrying cost per gross = $0.20 \times \text{Rs } 560$	112

## (ii) Statement showing total annual cost of inventory

	1	2	3	4	5	6
1 Size of quantity order (gross)						
2 Number of orders	36	18	12	9	8*	6
3 Cost per order (Rs)	30	30	30	30	30	30
4 Total order cost ( $2 \times 3$ )	1,080	540	360	270	240	180
5 Carrying cost per gross (Rs)	112	112	112	112	112	112

(Contd.)

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(Contd.)

	0.5	1	1.5	2	2.5	3
6 Average inventory (size of order $\div$ 2)						
7 Total carrying cost (5 $\times$ 6)	<u>56</u>	<u>112</u>	<u>168</u>	<u>224</u>	<u>280</u>	<u>336</u>
8 Total annual cost (4 + 7)	<u>1,136</u>	<u>652</u>	<u>528</u>	<u>494</u>	<u>520</u>	<u>516</u>

\*More than 7 orders are to be placed to have 36 gross quantity and, therefore, 8 orders.

(iii) Re-order level (minimum stock): = Safety stock + (daily usage  $\times$  lead time) = 1 gross + (36 gross/240 days)  $\times$  20 days = 4 gross.

## CHAPTER 17

### **Solution RQ.17.10**

*Decision analysis: in-house management alternative*

Relevant costs	Amount (Rs lakh)
Cash discount 8.10	(Rs 810 × 0.02 × 0.5)
Cost of funds in receivables	23.39 (see working note 1)
Bad debt losses	8.10 (Rs 810 × 0.01)
Total	39.59

*Decision analysis; non-recourse factoring alternative*

Relevant cost	Amount (Rs lakh)
Factoring commission	32.40 (Rs 810 × 0.04)
Discount charge	9.69 (working note 2)
Cost of owned funds invested in receivables	2.78 (Rs 810 lakh – Rs 660.96 lakh) × 0.28 × 24/360
Total	44.87

### **Working Notes:**

- 1 *Cost of funds invested in receivables:*

Average collection period = (10 days × 0.5) + (70 days × 0.5) = 40 days

Average investment in debtors = Rs 810 lakh/9 = Rs 90 lakh

Cost of bank funds = (Rs 90 lakh × 0.67 × 0.25) = Rs 15.075 lakh

Cost of owned funds = (Rs 90 lakh × 0.33 × 0.28) = Rs 8.316 lakh

Total cost = Rs 15.075 lakh + Rs 8.316 lakh = Rs 23.39 lakh

2. Eligible amount of advance =  $0.85 \times (\text{Rs.810 lakh} - \text{Rs 32.4 lakh}) = \text{Rs 660.96 lakh}$

Discount charge = (Rs 660.96 lakh × 0.22 × 24/360) = Rs 9.69 lakh

*Decision analysis: cost benefit of non-recourse factoring*

	Amount (Rs in lakh)
Benefits/savings of cost with in-house management alternative	39.59
Cost (of non-recourse factoring alternative)	44.87
Net loss	(5.28)

**Recommendation:** Udar Limited should not go for factoring alternative.

### **Solution RQ.17.11**

*Decision analysis: in-house management alternative*

Relevant costs	Amount (Rs in lakh)
Annual credit and collection expenditure	20.00
Bad debts	12.00 (0.01 × 1,200)
Cost of funds in receivables	52.50 (see working note 1)
Total	84.50

*Decision analysis; non-recourse factoring alternative*

Relevant cost	Amount (Rs in lakh)
Factoring commission	42.00 (1,200 × 0.035)
Discount charge	33.97 (see working note 2)

(Contd.)

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(Contd.)

Cost of owned funds invested in receivables	9.58 $(1,200 - \text{Rs } 926.40) \times 0.21 \times 60/360$
Total	85.55

### Working Notes:

1 *Cost of funds invested in receivables:*

Average investment in debtors = Rs 1,200 lakh/4.8 = Rs 250 lakh

Cost of funds = (Rs 250 lakh  $\times$  0.21) = Rs 52.5 lakh

2 Eligible amount of advance =  $0.80 \times (\text{Rs } 1,200 \text{ lakh} - \text{Rs } 42 \text{ lakh}) = \text{Rs } 926.40 \text{ lakh}$

Discount charge =  $(\text{Rs } 926.40 \text{ lakh} \times 0.22 \times 60/360) = \text{Rs } 33.97 \text{ lakh}$

*Decision analysis: cost benefit of non-recourse factoring alternative*

	Amount (Rs in lakh)
Benefits (15 + 12 + 52.50)	79.50
Cost (of non-recourse factoring alternative)	85.55
Net loss	(6.05)

*Cost of recourse factoring alternative*

Relevant cost	Amount (Rs in lakh)
Factoring commission	24.00 $(1,200 \times 0.02)$
Discount charge	34.50 (working note 3)
Cost of owned funds invested in receivables	9.07 $(1,200 - \text{Rs } 940.80) \times 0.21 \times 60/360$
Total	67.57

3 Eligible amount of advance =  $0.80 \times (\text{Rs } 1,200 \text{ lakh} - \text{Rs } 24 \text{ lakh}) = \text{Rs } 940.80 \text{ lakh}$

Discount charge =  $(\text{Rs } 940.80 \text{ lakh} \times 0.22 \times 60/360) = \text{Rs } 34.50 \text{ lakh}$

*Decision analysis: recourse factoring alternative*

	Amount (Rs lakh)
Benefits (15 + 52.50)	67.5
Cost of recourse factoring alternative	67.57
Net loss	(0.07)



## CHAPTER 18

### **Solution RQ.18.9**

(i) Operating statement of X Ltd. and Y Ltd.

Particulars	X Ltd	Y Ltd
Sales revenue	Rs 36,00,000	Rs 36,00,000
Less: cost of goods sold	24,30,000	26,10,000
selling expenses	2,70,000	2,70,000
administrative expenses	90,000	1,50,000
depreciation	1,20,000	90,000
EBIT	6,90,000	4,80,000
Cost of goods sold break-up		
Variable costs	10,80,000 <sup>1</sup>	21,60,000 <sup>2</sup>
Fixed costs	13,50,000	4,50,000
	24,30,000	26,10,000

<sup>1</sup>30 per cent of sales

<sup>2</sup>60 per cent of sales

(ii)  $DOL(X) = (\Delta EBIT \div EBIT) / (\Delta Sales \div Sales) = (Rs\ 3,90,000 \div Rs\ 3,00,000) / (Rs\ 6,00,000 \div Rs\ 30,00,000) = 6.5.$

$DOL(Y) = (Rs\ 2,10,000 \div Rs\ 2,70,000) / (Rs\ 6,00,000 \div Rs\ 30,00,000) = 3.88.$

Alternatively,

$DOL(X) = (Sales - VC) / (Current EBIT) = (Rs\ 30,00,000 - Rs\ 10,50,000) / 3,00,000 = 6.5.$

$DOL(Y) = Rs\ 30,00,000 - Rs\ 19,50,000 / 2,70,000 = 3.88.$

(iii) Royal Industries Ltd should purchase Y Ltd.

### **Solution RQ.18.10**

Market price per share (MPS) under proposed financial plans

	Equity shares	Preference shares	Debentures
EBIT (Rs 75 lakh $\times$ 0.12)	Rs 9,00,000	Rs 9,00,000	Rs 9,00,000
Less interest	56,000	56,000	2,56,000
EBT	8,44,000	8,44,000	6,44,000
Less taxes (0.35)	2,95,400	2,95,400	2,25,400
EAT	5,48,600	5,48,600	4,18,600
Less preference dividend	1,08,000	3,58,000	1,08,000
Earnings available for equityholders	4,40,600	1,90,600	3,10,600
Number of equity shares	40,000	20,000	20,000
EPS	11.02	9.53	15.53
P/E ratio	15	12	10
MPS	165.3	114.4	155.3

**Recommendation:** Issuing equity shares is the best alternative as it maximises the MPS.

**Solution RQ.18.11**

(i) Two EBIT-EPS coordinates for each financial plan

	Financing plans	
	1	2
Interest on debentures	Rs 50,000	Rs 1,65,000
Dividend on preference shares before taxes (Rs 3,00,000/(1- 0.35))	4,61,538	—
(a)	5,11,538	1,65,000
Expected EBIT	12,50,000	12,50,000
Less interest on debentures	50,000	1,65,000
EBT	12,00,000	10,85,000
Less taxes	4,20,000	3,79,750
EAT	7,80,000	7,05,250
Less preference shares dividend	3,00,000	—
Earnings for equity holders	4,80,000	7,05,250
Number of shares	15,000	30,000
EPS	(b) 32	23.51

Coordinate	EBIT Financial plan		EPS Financial plan	
	1	2	1	2
Lower (one)	Rs 5,11,538	Rs 1,65,000	Zero	Zero
Higher (two)	12,50,000	12,50,000	Rs 32	Rs 23.51

(ii) (a) *Indifference point*:  $[(X - D(1 - t) - D_p)/N_1] = [(X - I(1 - t))/N_2] = [(X - \text{Rs } 50,000) \times 0.65 - \text{Rs } 3,00,000]/15,000 = [(X - \text{Rs } 1,65,000) \times 0.65]/30,000$  or  $[0.65X - \text{Rs } 32,500 - \text{Rs } 3,00,000]/15,000 = [0.65X - \text{Rs } 1,07,250]/30,000$ .

Multiplying both sides of the equation by 30,000, we have,

$$2(0.65X - \text{Rs } 3,32,500) = 0.65X - \text{Rs } 1,07,250$$

$$X - \text{Rs } 6,65,000 = 0.65X - \text{Rs } 1,07,250$$

$$0.65X = \text{Rs } 5,57,750, \text{ or } X = \text{Rs } 8,58,077.$$

(b) *Financial break even points*:  $I + D_p/(1 - t)$ , Plan 1 = Rs 50,000 + (Rs 3,00,000)/0.65 = Rs 5,11,538, Plan 2 = Rs 1,65,000.

(iii) *Financial risk is measured by the DFL*. Plan 1 has more financial risk as its DFL is likely to be higher.

(iv) *Plan 2 is better for EBIT level of less than Rs 8,58,077; Plan 1 is better for EBIT ranges beyond that level.*

(v) *Plan 1, as EPS will be higher [(determined in (i) above)].*

**Solution RQ.18.12**

(i) *Financial break-even point* =  $I + D_p/(1 - t)$

Financial plan 1 = zero

$$2 = \text{Rs } 6,000 + (\text{Rs } 1,100/0.65) = \text{Rs } 7,692$$

$$3 = \text{Rs } 3,000 + (\text{Rs } 2,200/0.65) = 6,385$$

(ii)  $DFL = EBIT/[EBIT - I - D_p/(1 - t)]$

$$\text{Financial plan 1} = \text{Rs } 50,000/\text{Rs } 50,000 = 1$$

$$2 = \text{Rs } 50,000/(\text{Rs } 50,000 - \text{Rs } 7,692) = 1.18$$

$$3 = \text{Rs } 50,000/(\text{Rs } 50,000 - \text{Rs } 6,385) = 1.15$$

Financial plan 2 has higher financial risk.

**Solution RQ.18.13****(i) Income statement**

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Sales revenue (SR)	Rs 20,00,000
Less: variable cost (VC)	14,00,000
operating fixed costs (Rs 4,00,000 – 1,50,000)	<u>2,50,000</u>
EBIT	3,50,000
Less interest	<u>1,50,000</u>
Net earnings before taxes	<u>2,00,000</u>
DOL = (SR – VC)/EBIT	1.71
DFL = EBIT/(EBIT – I)	1.75
DCL = (DOL × DFL)	<u>2.99</u>

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## CHAPTER 19

### **Solution RQ.19.14**

*Determination of optimum capital structure*

$K_d$	$B/V$	$K_e$	$S/V$	$K_o = [(K_d(B/V) + (K_e(S/V))]$
7.15	0	13	1	13
7.15	0.1	13	0.9	12.4
7.54	0.2	14	0.8	12.7
7.8	0.3	15	0.7	12.8
8.45	0.4	16	0.6	13
9.75	0.5	18	0.5	13.9
11.7	0.6	20	0.4	15

Capital structure, having a debt level of 10 per cent, is optimal.

### **Solution RQ.19.15**

Value of unlevered firm,  $V_u = \text{EBIT} (1 - t)/K_e = \text{Rs } 2,00,000 (1 - 0.35)/0.20 = \text{Rs } 6,50,000$

Value of levered firm,  $V_l = V_u + B_t = \text{Rs } 6,50,000 + [\text{Rs } 6,00,000 (0.35)] = \text{Rs } 8,60,000$

$K_o$  of levered firm =  $0.20 (K_e = K_o)$

$K_o$  of levered firm

EBIT	Rs 2,00,000
Less interest	90,000
Net income after interest	1,10,000
Less taxes	38,500
NI for equityholders	71,500
Total market value (V)	8,60,000
Market value of debt (B)	6,00,000
Market value of equity (V - B)	2,60,000
$K_e = (\text{NI} \div S) = \text{Rs } 71,500/\text{Rs } 2,60,000$	0.275
$K_o = K_d(B/V) + K_e(S/V) = 0.0975 (\text{Rs } 6,00,000/\text{Rs } 8,60,000) + 0.275 (\text{Rs } 2,60,000/\text{Rs } 8,60,000)$	0.1511

### **Solution RQ.19.16**

(a) *Valuation of the firms (NI approach)*

Particulars	Firm P	Firm Q
EBIT	Rs 2,25,000	Rs 2,25,000
Less interest	75,000	—
Net income	1,50,000	2,25,000
Less taxes	52,500	78,750
NI for equityholders	97,500	1,46,250
$K_e$	0.20	0.20
S	4,87,500	7,31,250
B	5,00,000	—
(B + S)	9,87,500	7,31,250
$K_o$	0.1481*	0.20**

\* $0.0975 [(\text{Rs } 5,00,000)/9,87,500] + 0.20[(\text{Rs } 4,87,500)/9,87,500] = 0.1481$

\*\*  $0.20 = K_e$

## (b) Valuation of the firms (NOI approach)

$$\begin{aligned}
 V_Q &= \text{EBIT}(1 - t)/K_e = [\text{Rs } 2,25,000 \times (0.65)]/0.20 = \text{Rs } 7,31,250 \\
 V_P &= V_Q + B_t = \text{Rs } 7,31,250 + [\text{Rs } 5,00,000 \times 0.35] = \text{Rs } 9,06,250 \\
 S_P &= (V_P - B_P) = \text{Rs } 9,06,250 - \text{Rs } 5,00,000 = \text{Rs } 4,06,250 \\
 K_e &= \text{Rs } 97,500/4,06,250 = 0.24 \\
 K_o(P) &= K_d(B/V) + K_e(S/V) = [0.0975 \times (\text{Rs } 5,00,000/\text{Rs } 9,06,250)] + [0.24 \times (\text{Rs } 4,06,250/\text{Rs } 9,06,250)] \\
 &= 0.1614 \\
 K_o(Q) &= 0.20
 \end{aligned}$$

**Conclusion:** Firm P has optimal capital structure, under both the NI and NOI approaches.

**Solution RQ.19.17***Arbitrage process*

(a) Investor's current position (in firm Y)		
Dividend income ( $0.05 \times \text{Rs } 90,000$ )		Rs 4,500
Investment cost ( $0.05 \times \text{Rs } 4,50,000$ )		22,500
(b) He sells his holdings in firm Y for Rs 22,500 and creates a personal leverage by borrowing Rs 30,000 ( $0.05 \times \text{Rs } 6,00,000$ ). The total amount with him is Rs 52,500. Income required for break even is:		
Dividend income (Y firm)		4,500
Add interest on personal borrowings ( $0.10 \times \text{Rs } 30,000$ )		3,000
		7,500
(c) He purchases five per cent equity shares of the firm X for Rs 50,000 as the total value of the firm is Rs 10,00,000.		
Dividend of the firm X ( $0.15 \times \text{Rs } 50,000$ )		7,500
Amount of investment		50,000

The investor, thus, can reduce his outlay by Rs 2,500 through the use of leverage.

Yes, there are limits to the arbitrage process; this process will come to an end when the values of both firm become identical.

**Solution RQ.19.18**

The arbitrage process involves the following steps.

Suppose an investor, Mr X, holds 10 per cent of the outstanding shares of the levered firm (B). His holdings and dividend income would be as follows:

(i) Investment outlay ( $0.10 \times \text{Rs } 93,750$ )	Rs 9,375
(ii) Dividend income ( $0.16 \times 9,375$ )	1,500

He sells his holdings in firm B and invests in the unlevered firm, A. Since firm A has no debt, the financial risk of Mr.X would be less. To reach the level of financial risk of firm B, he borrows additional funds equal to his proportionate share in the levered firm's debt on his personal account (Rs 2,000 at 12.5 per cent rate of interest). He buys 10 per cent of the outstanding shares of the unlevered firm A at Rs 20,000 ( $0.10 \times \text{Rs } 2,00,000$ ). Mr X's position in firm A is summarised below.

(i) Total funds available		
Own funds	Rs 9,375	
Borrowed funds	12,000	21,375
(ii) Investment outlay		
(iii) Dividend income		
Gross ( $0.10 \times \text{Rs } 30,000$ )	3,000	
Less interest payable on borrowed funds	1,500	1,500

Mr X is earning the same amount of dividend as in company B. But his investment outlay in company A is less by Rs 1,375. Thus, the investor is better off by selling his securities in the

levered firm B, and buying the shares of the unlevered firm, A. Other investors will also enter into the arbitrage process. As a result, the price of the shares of the levered firm will decline, and that of unlevered firm will increase. This will continue till it is possible to reduce investment outlays and get the same return. Beyond this point, arbitrage will not be beneficial. This is the point of equilibrium. At this point, the total value of two firms as well as cost of capital would be identical. Thus, the value of the firm is independent of the proportion of debt to total capitalisation. But in actual practice, cost of capital is affected by leverage.

## CHAPTER 20

### **Solution RQ.20.6**

*Market value of shares under different financing alternatives*

Particulars	15% Debt	Equity shares
Sales revenue	Rs 57,75,000	Rs 57,75,000
Less fixed costs	5,00,000	5,00,000
Less Variable costs (2/3 of sales)	38,50,000	38,50,000
EBIT	14,25,000	14,25,000
Less interest	1,75,000	1,00,000
EBT	12,50,000	13,25,000
Less taxes	4,37,500	4,63,750
EAT	8,12,500	8,61,250
Number of equity shares (N)	50,000	55,000
EPS (EAT ÷ N)	16.25	15.66
P/E ratio (times)	10	12
Market price (EPS × P/E ratio)	162.50	187.92

**Recommendation:** Equity financing should be adopted by the company, as it maximises the MPS.

### **Solution RQ.20.7**

*Determination of EPS at various levels of EBIT under alternative financing plans*

Particulars	EBIT								
	Rs 40,000			Rs 80,000			Rs 1,20,000		
	Equity	Equity + debt	Equity + preference	Equity	Equity + debt	Equity + preference	Equity	Equity + debt	Equity + preference
EBIT	40,000	40,000	40,000	80,000	80,000	80,000	1,20,000	1,20,000	1,20,000
Less interest	—	0,000	—	—	20,000	—	—	20,000	—
EBT	40,000	20,000	40,000	80,000	60,000	80,000	1,20,000	1,00,000	1,20,000
Less taxes (0.35)	14,000	7,000	14,000	28,000	21,000	28,000	42,000	35,000	42,000
EAT	26,000	13,000	26,000	52,000	39,000	52,000	78,000	65,000	78,000
Less dividends (preference)	—	—	5,000	—	—	25,000	—	—	25,000
Earnings available for equityholders	26,000	13,000	1,000	52,000	39,000	27,000	78,000	65,000	53,000
Number of equity shares	50,000	25,000	25,000	50,000	25,000	25,000	50,000	25,000	25,000
EPS	0.52	0.52	0.04	1.04	1.56	1.08	1.56	2.6	2.12
P/E ratio (number of times)	10	8	9	10	8	9	10	8	9
MPS	5.2	4.16	0.36	10.40	12.48	9.72	15.60	20.8	19.08

**Recommendation:** (i) Equity plan is preferred when EBIT is Rs 40,000 (ii) In cases of EBIT levels of Rs 80,000 and Rs 1,20,000, equity + debt plan is recommended.

### **Solution RQ.20.8**

*Determination of expected market price (MPS)*

	16% Loan	Equity issue + 16% Loan
EBIT [0.20 × capital employed of Rs 1,70,00,000 (Rs 1,50,00,000) – Rs 16,00,000 debentures paid + Rs 36,00,000 new issues]]	Rs 34,00,000	Rs 34,00,000

(Contd.)

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(Contd.)

Less interest	7,76,000	4,88,000
EBT	26,24,000	29,12,000
Less taxes (0.35)	9,18,400	10,19,200
Profit after taxes	17,05,600	18,92,800
Number of equity shares	4,00,000	5,00,000
EPS	4.26	3.79
P/E ratio	6	6.15
MPS	25.56	23.31

Plan A (16% Loan) is better as the MPS is higher under this plan.

### Working Notes

#### 1. Total capital employed

Equity capital	Rs 40,00,000 (4,00,000 × Rs 10)
Reserves and surplus	81,50,000
12.5 per cent Debentures	16,00,000 (Rs 2,00,000 ÷ 0.125)
16 per cent Long-term loan	12,50,000 (Rs 2,00,000 ÷ 0.16)
	<u>1,50,00,000</u>

Profit before interest and tax = Rs 24,00,000

EBIT = Rs 24,00,000 ÷ Rs 1,50,00,000 = 0.16 or 16 per cent.

2. Debt amount of Rs 48,50,000 in the total capital employed Rs 1,70,00,000, yields a debt-equity ratio of 28.53 per cent. Accordingly, the relevant P/E ratio in the case of the debt plan will be 6 times.

### Solution RQ.20.9

#### (i) Debt to assets ratio

	12% Debt	Equity issue
Total debt*	Rs 30,00,000	Rs 20,00,000
Total assets (Rs 50 lakh + Rs 10 lakh)	60,00,000	60,00,000
Debt ratio (Debt ÷ assets)	0.50	0.333

\*Existing, Rs 20 lakh + additional, Rs 10 lakh

#### (ii) Expected net income

Current operating profits	Rs 8,00,000	Rs 8,00,000
Additional profits	2,00,000	2,00,000
Total operating profits	10,00,000	10,00,000
Less interest	2,70,000*	1,50,000
Profit before taxes	7,30,000	8,50,000
Less taxes	2,55,500	2,97,500
Profit after taxes (NI)	4,74,500	5,52,500
Outstanding shares (N)	20,000	28,000
EPS (NI ÷ N)	23.72	19.73
Expected P/E ratio	7	8.5
Expected MPS (EPS × P/E ratio)	166.1	167.72

\*Rs 1,50,000 + Rs 1,20,000 = Rs 2,70,000

#### (iii) Dividend yield

Dividend per share	11.86	9.87
Dividend yield (dividend ÷ MPS)	0.714	0.0588

The company should use the equity financing plan to maximise market value of its shares.



## CHAPTER 22

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### ***Solution RQ.22.16***

1. Number of new shares =  $\text{Rs.}18,00,000/\text{Rs.}50 = 36,000$  shares
2. Number of shares per right =  $9,00,000/36,000 = 25$ , that is, 25 shares are needed to purchase a new share at Rs.50.
3. Additional shares, an investor holding 96,000 shares of HL, can purchase on exercising his rights:  
$$= 96,000/25 = 3,840 \text{ shares}$$
4. (i) Theoretical value of a right when the share sells cum-rights:  
$$= \frac{58 - 50}{25 + 1} = \text{Re.}0.31$$
  
(ii) Theoretical value of a right when the share sells ex-rights:  
$$= \frac{57.69^* - 50}{25} = \text{Re.}0.31$$
  
\*  $\text{Rs.}58 - \text{Re.}0.31$
5. Amount the investor holding 96,000 shares of HL would get for his rights immediately after the share goes ex-rights:  
$$= 96,000 \times \text{Re. } 0.31 = \text{Rs.}29,760$$

## CHAPTER 23

### *Solution RQ.23.18*

Decision analysis for bond refunding decision

Present value of annual cash flow saving (Refer working note 2):	
Rs 5,24,655 x 10.594 (PVIFA <sub>07.20</sub> )	Rs 55,58,195
Less: initial investment (Refer working note 1)	<u>40,77,600</u>
Net present value of refunding	<u>14,80,595</u>

### *Working Notes*

#### 1. Initial investment:

##### (a) Call premium:

Before tax [(Rs 1,140 – Rs 1,000) × 40,000 bonds]	Rs 56,00,000	
Less: Tax (0.35 x Rs 56,00,000)	<u>19,60,000</u>	
After-tax cost of call premium		Rs 36,40,000

##### (b) Flotation cost of new bond

5,30,000

##### (c) Tax savings from unamortized flotation cost of old bond

(20/25 × 3,30,000 × 0.35)	(92,400)
	<u>40,77,600</u>

#### 2. Annual cash flow savings

##### (a) Old bond

##### (i) Interest cost:

Before tax (0.15 x Rs 4 crore)	Rs 60,00,000	
Less: Tax (0.35 x 60,00,000)	<u>21,00,000</u>	
After tax interest cost		39,00,000

##### (ii) Tax savings from amortization of flotation cost [(3,30,000/25) x 0.35]

(4,620)

Annual after-tax debt payment (a)

38,95,380

##### (b) New bond

##### (i) Interest cost:

Before tax (0.13 x Rs 4 crore)	Rs 52,00,000	
Less: Tax (0.35 x 52,00,000)	<u>18,20,000</u>	
After tax interest cost		33,80,000

##### (ii) Tax savings from amortization of flotation cost [(5,30,000/20) x 0.35]

(9,275)

Annual after-tax debt payment (b)

33,70,725

Annual cash flow savings [(a)-(b)]

5,24,655

### *Solution RQ.23.19*

Decision analysis for bond refunding decision

Present value of annual cashflow saving (Refer working note 2):	
Rs 5,18,133 x 8.560 (PVIFA <sub>08.15</sub> )	Rs 44,35,218
Less: initial investment (Refer working note 1)	<u>27,02,000</u>
Net present value of refunding	<u>17,33,218</u>

### *Working Notes*

#### 1. Initial investment:

##### (a) Call premium:

Before tax [(Rs 1,170 – Rs 1,000) × 20,000 bonds]	Rs 34,00,000	
Less: Tax (0.35 × Rs 34,00,000)	<u>11,90,000</u>	
After-tax cost of call premium	Rs 22,10,000	
(b) Flotation cost of new bond		4,00,000
(c) Overlapping interest:		
Before tax (0.12 × 2/12 × Rs 2 crore)	4,00,000	
Less: Tax (0.35 × 4,00,000)	<u>1,40,000</u>	
After-tax cost of overlapping interest	2,60,000	
(d) Tax savings from unamortized discount on old bond [15/20 × (20,000 bonds × Rs 20/bond discount) × 0.35]	(1,05,000)	
(e) Tax savings from unamortized flotation cost of old bond (15/20 × 2,40,000 × 0.35)	<u>(63,000)</u>	
	<u>27,02,000</u>	
<b>2. Annual cash flow savings</b>		
(a) Old bond		
(i) Interest cost:		
Before tax (0.16 × Rs 2 crore)	Rs 32,00,000	
Less: Tax (0.35 × 32,00,000)	<u>11,20,000</u>	
After tax interest cost	20,80,000	
(ii) Tax savings from amortization of discount [(Rs 4,00,000/20) × 0.35]	(7,000)	
(iii) Tax savings from amortization of flotation cost [(2,40,000/20) × 0.35]	<u>(4,200)</u>	
Annual after-tax debt payment (a)		20,68,800
(b) New bond		
(i) Interest cost:		
Before tax (0.12 × Rs 2 crore)	Rs 24,00,000	
Less: Tax (0.35 × 24,00,000)	<u>8,40,000</u>	
After tax interest cost	15,60,000	
(ii) Tax savings from amortization of flotation cost [(4,00,000/15) × 0.35]	<u>(9,333)</u>	
Annual after-tax debt payment (b)		15,50,667
Annual cash flow savings [(a)-(b)]		<u>5,18,133</u>

## CHAPTER 24

### ***Solution RQ.24.13***

1. Computation of straight debenture value

<i>Years</i>	<i>Payments (1)</i>	<i>PVIFA(0.11) (2)</i>	<i>Present value (3) [(1) x (2)]</i>
1-10	Rs.100	5.889	Rs 588.9
10	1,000	0.352	352.0
			<u>940.9</u>

2. Computation of conversion value of debentures

<i>Market price of shares (1)</i>	<i>Conversion ratio (2)</i>	<i>Conversion value (3) [(1) x (2)]</i>
Rs.15	50	Rs.750
20 (conversion price)	50	1,000 (par value)
23	50	1,150
30	50	1,500
45	50	2,250

3. The debenture would be expected to sell at the higher of the conversion value and straight value. In no case, it would sell for less than the straight value (Rs.940.9). At a price of Rs.15, the debenture would sell for its straight value of Rs.940.9. At other prices, it would be expected to sell at the respective conversion value.
4. The minimum price the debenture would be expected to sell at irrespective of the behavior of share prices is its straight value of Rs.940.9

### ***Solution RQ.24.14***

- a. Computation of straight debenture value

<i>Years</i>	<i>Payments (1)</i>	<i>PVIFA(0.14) (2)</i>	<i>Present value (3) [(1) x (2)]</i>
1-10	Rs 120	5.216	Rs 625.92
10	1,000	0.270	<u>270.00</u>
			895.92

- b. Implied price of all warrants = Rs.1,000 – 895.92 = Rs.104.08
- c. Implied price of each warrant = Rs.104.08/10 = Rs.10.41
- d. The implied price of a warrant (Rs.10.41) is less than its theoretical value (Rs.12.5). The debenture is therefore fairly priced. Each warrant is expected to sell at its theoretical value, that is, Rs.12.5 while the company has charged only Rs.10.41. The debenture has, therefore, been issued at a price that is Rs.20.92 [(895.92 + 12.50x10)-1,000] less than its expected market value.

### ***Solution RQ.24.15***

Theoretical value of a warrant =  $(P_0 - E) \times N$

Where  $P_0$  = current market price of a share,  $E$  = exercise price of the warrant and  $N$  = number of shares obtainable with one warrant.

Computation of Theoretical Warrant Value

<i>Price per share</i>	<i>Exercise price of warrant (E)</i>	<i>Number of shares obtainable with one warrant (N)</i>	<i>Theoretical warrant (<math>P_0</math>) value</i>
(1)	(2)	(3)	$[(1-2) \times 3]$
Rs 63	Rs 75	2	0*
69	75	2	0*
72	75	2	0*
81	75	2	Rs 12
87	75	2	24
93	75	2	36
99	75	2	48

\* The value of a warrant cannot be negative. In case, the theoretical value of a warrant turns out to be negative, the warrant is treated as worthless. Its value is, therefore, taken as zero.

## CHAPTER 25

### **Solution RQ.25.18**

A lease is finance lease if one of the following two conditions is satisfied:

- (i) The lease term exceeds 75 per cent of the useful life of the equipment (the minimum of physical useful life, technological life and product market life).
  - (ii) The PV of lease payments exceeds 90 per cent of the fair market value of the equipment (cost of equipment), the discount rate being incremental borrowing rate in the case of lessee and cost of capital in the case of lessor.
- (a) (i) Term of lease is 9/14 years = 64 per cent.  
(ii) *Determination of PV of lease payment (Rs in lakh)*

Year	Lease payment	Discount factor (0.22)	Total PV
1 – 6	900	3.167	Rs 2,850
7 – 9	37.5	0.62*	23
			<u>2,873</u>

\*(0.249 + 0.204 + 0.167)

The lease is finance lease as the PV of lease payment exceeds the cost of asset.

- (b) Finance lease as term of lease is 9/9 = 100 per cent.

### **Solution RQ.25.19**

- (a) (i) Term of lease = 64 per cent.  
(ii) *Determination of PV of lease payment*

– *First 6 years:*

$$\begin{aligned} & \text{Rs } 2,500 \text{ lakh} \times 0.026 \times 12 \times \text{PIVFA}_m(23,6) \\ &= \text{Rs } 780 \text{ lakh} \times i/(d)^{1/2} \times \text{PVIFA}(i, 3) \text{ where } i = 0.23 \text{ and } d = \text{discount factor} \\ &= \text{Rs } 780 \text{ lakh} \times 1.121 \times 3.092 = \text{Rs } 2,703.6 \text{ lakh} \end{aligned}$$

– *Next 3 years:*

$$\begin{aligned} & \text{Rs } 2,500 \text{ lakh} \times 0.0015 \times 12 \times \text{PVIFA}_m(23, 7-9 \text{ years}) \\ &= \text{Rs } 45 \text{ lakh} \times 1.121 \times 12 \times [0.235 + 0.191 + 0.155] = \text{Rs } 351.7 \text{ lakh} \\ & \text{– Total PV: Rs } 2,703.6 \text{ lakh} + \text{Rs } 351.7 \text{ lakh} = \text{Rs } 3,055.3 \text{ lakh} \end{aligned}$$

The lease is a finance lease.

- (b) Finance lease.

### **Solution RQ.25.20**

- (i) Term of lease is 9/10 years = 90 per cent.  
(ii) *Determination of PV of lease payments (in lakh of Rs)*

Year	Lease payment	Discount factor (0.25)	Total PV
1 – 6	900	2.951	2,656
7 – 9	37.5	0.512*	19
10 (salvage value)	250	0.107	27
Total PV			<u>2,702</u>

\*(0.210 + 0.168 + 0.134)

The lease is finance lease as both the conditions of a finance lease are satisfied.

**Solution RQ.25.21***PV of cash outflows under leasing alternative*

<i>Year-end</i>	<i>Lease payment (net)</i>	<i>Tax shield</i>	<i>Cash outflows after taxes</i>	<i>PV factor (0.07)</i>	<i>Total PV</i>
0	Rs 4,00,000*	—	Rs 4,00,000	1.000	Rs 4,00,000
1–5	4,00,000	Rs 2,00,000	2,00,000	4.100	8,20,000
6	—	2,00,000	(2,00,000)	0.666	(1,33,200)
					10,86,800

\*(Rs 4,50,000, lease rent – Rs 50,000 saving in maintenance expenses).

*Schedule of debt payment*

<i>Year end</i>	<i>Loan instalment</i>	<i>Loan at the beginning of the year</i>	<i>Payment</i>		<i>Principal outstanding at the end of the year (Col 3 – Col 5)</i>
			<i>Interest on loan (Col 3 × 0.14)</i>	<i>Principal re-payment (Col 2–Col 4)</i>	
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1	Rs 5,14,271	Rs 20,00,000	Rs 2,80,000	Rs 2,34,271	Rs 17,65,729
2	5,14,271	17,65,729	2,47,202	2,67,069	14,98,660
3	5,14,271	14,98,660	2,09,812	3,04,459	11,94,201
4	5,14,271	11,94,201	1,67,188	3,47,083	8,47,118
5	5,14,271	8,47,118	1,18,596	3,95,675	4,51,443
6	5,14,271	4,51,443	62,828	4,51,443	—

*PV of after tax cash outflows under buying alternative*

<i>Year-end</i>	<i>Loan instalment</i>	<i>Tax advantage on interest</i>	<i>Tax advantage on depreciation</i>	<i>Net cash outflows (Col 2 – Col 3 + 4)</i>	<i>PV factor at after tax cost of debt (0.07)</i>	<i>Total PV</i>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
1	Rs 5,14,271	Rs 1,40,000	Rs 1,50,000	Rs 2,24,271	0.935	Rs 2,09,693
2	5,14,271	1,23,601	1,50,000	2,40,670	0.873	2,10,105
3	5,14,271	1,04,906	1,50,000	2,59,365	0.816	2,11,642
4	5,14,271	83,594	1,50,000	2,80,677	0.763	2,14,157
5	5,14,271	59,298	1,50,000	3,04,973	0.713	2,17,446
6	5,14,271	31,414	1,50,000	3,32,857	0.666	2,21,683
						12,84,726
						Less PV of salvage value (Rs 2,00,000 × 0.666)
						(1,33,200)
						Net cash outflows under buying alternative
						11,51,526

**Recommendation:** Computer should be acquired on lease basis.

**Solution RQ.25.22***PV of cash outflows under leasing alternative*

Year	Payments under lease		Tax advantage on lease payment (0.35)	Net cash outflows	PV factor (0.13)	Total PV
	Lease rent	5% of annual billing				
1	2	3	4	5	6	7
1	Rs 85,000	Rs 11,000	Rs 33,600	Rs 62,400	0.885	Rs 55,224
2	85,000	13,000	34,300	63,700	0.783	49,877
3	85,000	13,000	34,300	63,700	0.693	44,144
						1,49,245

*PV of cash outflows under buying alternative*

Year	Obligations under buying		Tax advantage @ 0.35			Net cash outflows	PV factor	Total PV
	Loan payment	Maintenance, taxes	Interest	Depreciation	Maintenance			
1	2	3	4	5	6	7	8	9
1	Rs 46,000	Rs 20,000	Rs 16,100	Rs 20,125	Rs 7,000	Rs 22,775	0.885	Rs 20,156
2	46,000	20,000	16,100	15,094	7,000	27,806	0.783	21,772
3	2,76,000	20,000	16,100	11,320	7,000	2,41,580	0.693	1,67,415
3	Salvage value (beginning of year 4)					(1,10,000)	0.693	(76,230)
3	Tax on short-term capital gain*					4,539	0.693	3,146
								1,36,259

\*(Rs 2,30,000 – Rs 1,32,969 – Rs 1,10,000) = Rs 72,969 × 0.35 = Rs 4,539.

**Recommendation:** Computeronics Ltd should buy the computer.

*Viability from the view point of the lessor*

	Year 1	Year 2	Year 3
(a) Revenue:			
Lease rent	Rs 85,000	Rs 85,000	Rs 85,000
Add 5% of annual billing	11,000	13,000	13,000
Total	96,000	98,000	
(b) Costs:			
Maintenance	Rs 20,000	Rs 20,000	Rs 20,000
Depreciation	40,000	40,000	40,000
Total	60,000	60,000	60,000
EBT (a – b)	36,000	38,000	38,000
Less taxes	18,000	19,000	19,000
EAT	18,000	19,000	19,000
Add depreciation	40,000	40,000	40,000
CFAT (operating)	58,000	59,000	59,000
Add salvage value	–	–	1,10,000
CFAT (total)	58,000	59,000	1,69,000



*Determination of NPV*

<i>Year</i>	<i>CFAT</i>	<i>PV factor (at 0.12)</i>	<i>Total PV</i>
1	Rs 58,000	0.893	Rs 51,794
2	59,000	0.797	47,023
3	1,69,000	0.712	1,20,328
			2,19,145
	Less cost of computer		2,30,000
	NPV		(10,855)

From the point of view the lessor, the proposal is financially unsound.

***Solution RQ.25.23***

(a) *Determination of NAL for the lessor*

*Benefits from leasing:*

PV of lease rentals (working note 1)	Rs 2,32,186
PV of tax shield on depreciation (2)	43,464
PV of salvage proceeds	1,00,000
Total	3,75,650

*Cost of leasing:*

Cost of computer	2,30,000
PV of tax payment on lease rentals (3)	81,550
PV of tax payment on short-term capital gain (4)	5,261
Total	3,16,811
NAL	58,839

***Working Notes***

(1) *PV of lease rentals*

<i>Year</i>	<i>Lease rent</i>	<i>PV factor (at 0.12)</i>	<i>Total PV</i>
1	Rs 96,000	0.893	Rs 85,728
2	98,000	0.797	78,106
3	98,000	0.712	68,352
			2,32,186

(2) *PV of tax shield on depreciation*

<i>Year</i>	<i>Depreciation</i>	<i>Tax shield</i>	<i>PV factor (at 0.12)</i>	<i>Total PV</i>
1	Rs 69,000	Rs 24,150	0.893	Rs 21,566
2	48,300	16,905	0.797	13,473
3	33,810	11,833	0.712	8,425
	1,51,110			43,464

(3) *PV of tax payment on lease*

<i>Year</i>	<i>Lease rent</i>	<i>Tax shield</i>	<i>PV factor (at 0.12)</i>	<i>Total PV</i>
1	Rs 96,000	Rs 33,600	0.893	Rs 30,005
2	98,000	34,300	0.797	27,337
3	98,000	34,300	0.712	24,208
				81,550

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(4) PV of tax payment on short-term capital gain (at the beginning of the fourth year)

Salvage value		Rs 1,00,000
Less book value of computer		
Cost	Rs 2,30,000	
Less accumulated depreciation	(1,51,110)	78,890
Short-term capital gain		21,110
PV of tax payment (Rs 21,110 × 0.35 × 0.712)		5,261

(b) Determination of BELR (L) for the lessor

<b>Benefits from leasing:</b>		
PV of lease rentals (PVIFA, 12,3) × L		2.402L
Other benefits (already computed)	Rs 1,43,464	
<b>Cost of leasing:</b>		
PV of tax payment on lease rentals (2.402L × 0.35)		0.8407L
Other costs (already computed)	2,35,261	
BELR = 2.402L + Rs 1,43,464 = 0.8407 + Rs 2,35,261		
1.5614L = Rs 91,797 or L = Rs 91,797/1.5613 = Rs 58,795		

### Solution RQ.25.24

#### Present value of cash outflows under the leasing alternative

After-tax lease rental Rs 6,00,000 (1 – 0.35)	Rs 3,90,000
Present value of annuity of Re 1 for 5 years at 13% (after tax cost of borrowing)	(×) 3.517
Present value of cash outflows under leasing alternative	Rs 13,71,630

#### Present value of cash outflows under buy-borrow alternative

Year	Loan payment	Tax shield on		Cash outflows after tax	Present value factor @13%	Total present value
		Interest	Depreciation			
1	Rs 6,68,673	Rs 1,40,000	Rs 1,75,000	Rs 3,53,673	0.885	Rs 3,13,000
2	6,68,673	1,21,193	1,31,250	4,16,230	0.783	3,25,908
3	6,68,673	98,624	98,438	4,71,611	0.693	3,26,826
4	6,68,673	71,542	73,828	5,23,303	0.613	3,20,785
5	6,68,673	38,819	55,371	5,74,483	0.543	3,11,944
						15,98,463
Present value of salvage value (Rs 4,00,000 × 0.543)				(2,17,200)		
Present value of tax shield on short-term capital loss (Rs 74,609 × 0.35 × 0.543)						(14,179)
Present value of cash outflows						13,67,084

**Recommendation:** Since the present value of cash outflows is lower under buy-borrow alternative, the company is advised to opt for purchase of machinery.

### Working Notes:

#### 1. Computation of loan instalment

(a) Loan amount	Rs 20,00,000
(b) Present value of annuity of Re 1 for 5 years @20%	2.991
(c) Loan instalment payable (a ÷ b)	Rs 6,68,673

**2. Computation of interest and principal component of loan repayment**

Year	Loan instalment	Outstanding principal at beginning of year	Payment of		Outstanding principal at end of year
			Interest	Principal	
1	Rs 6,68,673	Rs 20,00,000	Rs 4,00,000	Rs 2,68,673	Rs 17,31,327
2	6,68,673	17,31,327	3,46,265	3,22,408	14,08,919
3	6,68,673	14,08,919	2,81,784	3,86,889	10,22,030
4	6,68,673	10,22,030	2,04,406	4,64,267	5,57,763
5	6,68,673	5,57,763	1,10,910	5,57,763	—

**3. Computation of depreciation**

Year	WDV beginning of the year	Depreciation @25%	WDV end of the year
1	Rs 20,00,000	Rs 5,00,000	Rs 15,00,000
2	15,00,000	3,75,000	11,25,000
3	11,25,000	2,81,250	8,43,750
4	8,43,750	2,10,938	6,32,812
5	6,32,812	1,58,203	4,74,609

**4. Computation of short-term capital loss**

WDV of machinery at the end of 5 years	Rs 4,74,609
Disposal value	4,00,000
Short-term capital loss	74,609

**Evaluation of leasing alternative from the lessor's point of view at 14% cost of capital**

Present value of cash outflows	Rs 20,00,000
Present value of cash inflows	
(a) After-tax lease rental	3,90,000
(b) Present value of annuity of Re 1 for 5 years at 14%	3.433
(c) Present value of cash inflows (Rs 3,90,000 × 3.433)	13,38,870
(d) Present value of tax shield on depreciation	3,93,296
(e) Present value of salvage value (Rs 4,00,000 × 0.519)	2,07,600
(f) Present value of tax shield on short-term capital loss (Rs 74,609 × 0.35 × 0.519)	13,553
Total present value of cash inflows	19,53,319
Net present value (present value of cash inflows – present value of cash outflows)	(46,681)

**Recommendation:** Since the net present value for the lessor is negative at 14 per cent cash of capital, leasing of machinery is not viable at this rate.

**Working Notes:****1. Computation of present value of tax shield on depreciation**

Year	Depreciation	Tax shield on depreciation @35%	Present value factor at 14%	Total present value
1	Rs 5,00,000	Rs 1,75,000	0.877	Rs 1,53,475
2	3,75,000	1,31,250	0.769	1,00,931
3	2,81,250	98,438	0.675	66,446
4	2,10,938	73,828	0.592	43,706
5	1,58,203	55,371	0.519	28,738
Total present value				3,93,296

**Solution RQ.25.25**

$$(i) \text{ Rs } 5,00,000 = \sum_{t=1}^8 \frac{\text{Rs } 1,25,000}{(1+r)^t}$$

Solution of  $r$  (internal rate of return) requires following steps:

- Determination of payback value ( $\text{Rs } 5,00,000 / \text{Rs } 1,25,000 = 4.000$  years)
- Look for the PV factor closest to 4.000 in the present value of annuity table in the year row 8 (which is equal to the life of the project). The two closest factors are 4.078 (at 18%) and 3.954 (at 19%).

$$\bullet \text{ IRR (by interpolation) } = 18\% + \frac{(4.078 - 4.000) \times 0.078}{(4.078 - 3.954) \times 0.124} = 18.63\%$$

(ii) Desired lease rent ( $LR_d$ ) = Cost of bus/PVIFA at 20 per cent for 8 years

$$LR_d = \text{Rs } 5,00,000 / 3.837 = \text{Rs } 1,30,310.14$$

(iii) Desired annual lease rent to earn 20 per cent IRR after taxes:

Let annual lease rent be  $X$

PV factor  $[(X - E - D)(1 - t) + D] + (\text{PV factor} \times \text{SV}) = \text{CO}$

$$3.837 [(X - \text{Rs } 50,000 - \text{Rs } 50,000) \times 0.6 + \text{Rs } 50,000] + (0.233 \times \text{Rs } 1,00,000) = \text{Rs } 5,00,000$$

$$3.837 [0.6x - \text{Rs } 60,000 + \text{Rs } 50,000] + \text{Rs } 23,300 = \text{Rs } 5,00,000$$

$$2.3022x - \text{Rs } 38,370 + \text{Rs } 23,300 = \text{Rs } 5,00,000$$

$$x = \text{Rs } 5,00,000 + 38,370 - 23,300 = \text{Rs } 5,15,070 / 2.3022 = \text{Rs } 2,23,729.47$$

## CHAPTER 27

### ***Solution RQ.27.12***

Since Mr. Kapoor has purchased the call option; he will be benefited by the upward movement in the market at the expiry of the contract, that is, the movement beyond the strike price. Since the market has moved upward as anticipated by Mr. Kapoor, he will end- up making profit. The calculation of profit is as under:

$$\begin{aligned}\text{Profit} &= \{[\text{Market Price at maturity}-\text{Strike price}] - \text{call premium paid}\} \times \text{Market lot size} \\ &= \{[\text{Rs. } 1330 - 1290] - \text{Rs. } 20\} \times 200 = \text{Rs. } 4000.\end{aligned}$$

### ***Solution RQ.27.13***

Since Ramesh has purchased the put option, he will be benefited by the downward movement in the market at the expiry of the contract; in other words, the market tumbles beyond the strike price. However, the market has risen beyond the strike price, not- in tune with the expectations of Ramesh. Therefore, Ramesh will not exercise his contract and end-up losing the upfront premium. His loss would be:

$$\begin{aligned}\text{Loss} &= \text{Premium} \times \text{Lot size} = \text{Rs. } 27 \times 200 \text{ (assuming the contract size as 200)} \\ &= \text{Rs. } 5400.\end{aligned}$$

### ***Solution RQ.27.14***

Computation of value of the call option contract at maturity:

Expected Price	Rs. 100	Rs. 115	Rs. 130	Rs. 150	Rs. 160	Total Value of the Option
Probability	0.15	0.20	0.30	0.20	0.15	
Exercise the Option (Yes/No)						
Strike Price: Rs. 132	No	No	No	Yes	Yes	
Value	Zero	Zero	Zero	$= (150-132) \times 0.2 =$ $= \text{Rs. } 3.6$	$= (160-132) \times 0.15 =$ $= \text{Rs. } 4.2$	<b>Rs. 7.8</b>

### ***Solution RQ.27.15***

The sigma used in the B-S model represents the annualized volatility. The relationship between daily and annualized volatility, assuming volatility to be constant over time, can be expressed as:

$$\begin{aligned}\text{Annualized volatility} &= \text{Daily Volatility} \times \{(\text{No. of days in a year})^{0.5}\} \\ &= 0.0175 \times 252^{0.5} = 0.0175 \times 16 = 0.28 \text{ or } 28 \text{ per cent.}\end{aligned}$$

## CHAPTER 28

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### ***Solution RQ.28.11***

The buyer of the call option with strike price of Rs. 176 and a premium of Rs. 18 will be able to break even (cover his total cost, i.e., Rs. 18) if the price of the underlying security becomes Rs. 194 (Rs. 176+18).

### ***Solution RQ.28.12***

This is an Out-of-the-money (OTM) call option because strike price > spot price.

### ***Solution RQ.28.13***

The value of the option = Intrinsic value + Time value. Intrinsic value refers to the value that the holder will get if he exercises the option immediately, i.e., Rs. 134-120= Rs. 14 in this case. The time value connotes the value that option is going to gain during its time-to-maturity, i.e., the market value of the option minus its intrinsic value. Thus, the time value of such an option is = Rs. 18 – 14 = Rs. 4.

### ***Solution RQ.28.14***

The sigma used in the B-S model represents the annualized volatility. This can be calculated as:

$$\begin{aligned}\text{Annualized volatility} &= \text{Daily Volatility} \times \{(\text{No. of days in a year})^{0.5}\} \\ &= 0.0192 \times 252^{0.5} = 0.0175 \times 16 = 0.3072 \text{ or } 30.72 \text{ per cent.}\end{aligned}$$

Assumption: Trading happens on 256 days in a year.

## CHAPTER 30

### **Solution RQ.30.9**

*Value of the firm (V) at varying retention ratios*

(a) 100%	(b) 10%	(c) No retention
$p = \frac{0 + \frac{0.15}{0.10} (\text{Rs } 5 - 0)}{0.10};$ $= \text{Rs } 7.5/0.10 = \text{Rs } 75$ $V = \text{Rs } 75 \times 10,00,000 \text{ shares}$ $= \text{Rs } 750 \text{ lakh}$	$p = \frac{\text{Rs } 2.5 + \frac{0.15}{0.10} (\text{Rs } 5 - \text{Rs } 2.5)}{0.10};$ $= \text{Rs } 6.25/0.10 = \text{Rs } 62.50$ $V = \text{Rs } 62.50 \times 10,00,000 \text{ shares}$ $= \text{Rs } 625 \text{ lakh}$	$p = \frac{\text{Rs } 5 + \frac{0.15}{0.10} (\text{Rs } 5 - \text{Rs } 5)}{0.10}$ $= \text{Rs } 5/0.10 = \text{Rs } 50$ $V = \text{Rs } 50 \times 10,00,000 \text{ shares}$ $= \text{Rs } 500 \text{ lakh}$

The value of the firm is maximum when retention ratio is 100 per cent; it is consistent with Walter's model. Its fundamental premise is that who can earn more. If the firm earns a return higher than the shareholders earn, 100 per cent retention is suggested and vice versa.

### **Solution RQ.30.10**

*Value of the share (P) at different pay-out ratios*

(a) 25%	(b) 50%	(c) 75%
$p = \frac{\text{Rs } 4 + \left[ \frac{0.10}{0.125} \right] (\text{Rs } 16 - \text{Rs } 4)}{0.125};$ $= \frac{\text{Rs } 4 + 0.8 (\text{Rs } 12)}{0.125} = \text{Rs } 108.8;$	$p = \frac{\text{Rs } 8 + \left[ \frac{0.10}{0.125} \right] (\text{Rs } 16 - \text{Rs } 8)}{0.125};$ $= \frac{\text{Rs } 8 + 0.8 (\text{Rs } 8)}{0.125} = \text{Rs } 115.2;$	$p = \frac{\text{Rs } 12 + \left[ \frac{0.10}{0.125} \right] (\text{Rs } 16 - \text{Rs } 12)}{0.125};$ $= \frac{\text{Rs } 12 + 0.8 (\text{Rs } 8)}{0.125} = \text{Rs } 121.6;$

None of the above D/P ratios would maximise the wealth of shareholders. The wealth of shareholders will be maximum (Rs 128) at D/P ratio of 100 per cent as shown below:

$$\frac{\text{Rs } 16 + \left[ \frac{0.10}{0.125} \right] (\text{Rs } 16 - \text{Rs } 16)}{0.125} = \text{Rs } 128$$

### **Solution RQ.30.11**

(a) *Price of the share,  $P_1$  when dividend is declared:*

$$P_0 = D_1 + P_1/(1 + K_e), \text{ Rs } 30 = (\text{Rs } 3 + P_1)/1.15 \text{ or } \text{Rs } 34.50 = \text{Rs } 3 + P_1 \text{ or } \text{Rs } 31.50 = P_1$$

$P_1$  when dividend is not declared:

$$\text{Rs } 30 = P_1/1.15, \text{ Rs } 34.50 = P_1$$

(b) *Amount of new financing*

(i) When dividend is declared	(ii) When dividend is not declared
$I - (E - nD_1)$ $= \text{Rs } 9,00,000 - \text{Rs } 2,00,000 = \text{Rs } 7,00,000$ $\Delta n = \text{Rs } 7,00,000/31.50$	$I - E$ $= \text{Rs } 9,00,000 - 5,00,000 = \text{Rs } 4,00,000$ $\Delta n = \text{Rs } 4,00,000/\text{Rs } 34.50$

$V$ , when dividend is declared

$$= [\text{Rs } 3,00,000 + 31.50 \times (1,00,000 + 7,00,000/31.5) - 9,00,000 + 5,00,000 - 3,00,000]/1.15$$

$$= [\text{Rs } 3,00,000 + \text{Rs } 38,50,000 - \text{Rs } 9,00,000 + \text{Rs } 5,00,000 - \text{Rs } 3,00,000]/1.15$$

$$= \text{Rs } 34,50,000/1.15 = \text{Rs } 30,00,000.$$

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*V, when dividend is not declared*

$$V = [1,00,000 + (4,00,000/34.5) \times \text{Rs } 34.50 - \text{Rs } 9,00,000 + \text{Rs } 5,00,000]/1.15 \\ = [\text{Rs } 38,50,000 - \text{Rs } 9,00,000 + \text{Rs } 5,00,000]/1.15 = \text{Rs } 34,50,000/1.15 = \text{Rs } 30,00,000.$$

Thus under MM assumptions, dividend does not affect the value of the firm.

### Solution RQ.30.12

<i>Dividends are paid</i>	<i>Dividends are not paid</i>
(a) <i>Price of the share at the end of the year (<math>P_1</math>):</i> $P_0 = (P_1 + D_1)/(1 + K_e)$ $\text{Rs } 100 = (P_1 + \text{Rs } 5)/(1 + 0.1)$ $P_1 = \text{Rs } 105$	$P_0 = (P_1 + D_1)/(1 + K_e)$ $\text{Rs } 100 = (P_1 + 0)/(1 + 0.1)$ $P_1 = \text{Rs } 110$
(b) <i>Amount required for financing:</i> $\text{Rs } 5 \text{ lakh} - (\text{Rs } 2.5 \text{ lakh} - \text{Rs } 1.25)$ $= \text{Rs } 3.75 \text{ lakh}$	$\text{Rs } 5 \text{ lakh} - \text{Rs } 2.5 \text{ lakh}$ $= \text{Rs } 2.5 \text{ lakh}$
(c) <i>Number of shares to be issued:</i> $\Delta n = \text{Rs } 3,75,000/105$	$\Delta n = \text{Rs } 2.5 \text{ lakh}/110$
(d) <i>Valuation of the firm (<math>V</math>):</i> $\text{Rs } 1,25,000 + \left(25,000 + \frac{\text{Rs } 3,75,000}{\text{Rs } 105}\right) \text{Rs } 105$ $- [\text{Rs } 5 \text{ lakh} + \text{Rs } 2.5 \text{ lakh} - \text{Rs } 1.25 \text{ lakh}]/1.1$ $= \text{Rs } 25 \text{ lakh}$	$\left(25,000 + \frac{\text{Rs } 2,50,000}{\text{Rs } 105}\right) \text{Rs } 110$ $- [\text{Rs } 5 \text{ lakh} + \text{Rs } 2.5 \text{ lakh}]/1.1$ $= \text{Rs } 25 \text{ lakh}$

Since the value of the firm is Rs 25 lakh, in both the situations when dividends are paid and when dividends are not paid, it can be concluded that the payment of dividend does not affect the value of the firm.

The major factors affecting the validity of MM's model are: (i) Tax effect, (ii) Flotation cost, (iii) Transaction and inconvenience costs, (iv) Preference for current dividend by investors and resolution of uncertainty.

### Solution RQ.30.13

(i) Computation of MPS under MM approach

$$P_0 = \frac{P_1 + D_1}{1 + K_e}$$

(a)  $P_1$  when dividend is declared

$$\text{Rs } 120 = (P_1 + \text{Rs } 6.4)/(1 + 0.096)$$

$$\text{Rs } 120 (1.096) = P_1 + \text{Rs } 6.4$$

$$\text{Rs } 131.52 - \text{Rs } 6.4 = P_1 \text{ or } P_1 = \text{Rs } 125.12$$

(b)  $P_1$  when dividend is not declared

$$\text{Rs } 120 = (P_1 + \text{zero})/1.096$$

$$\text{Rs } 131.52 = P_1$$

(ii) Computation of new shares

<i>Particulars</i>	<i>When dividend</i>	
	<i>is paid</i>	<i>is not paid</i>
(1) Net income	Rs 1,60,00,000	Rs 1,60,00,000
(2) Dividend paid (8 lakh $\times$ Rs 6.4)	51,20,000	Nil
(3) Retained earnings (1 - 2)	1,08,80,000	1,60,00,000

(Contd.)



(Contd.)

(4) Investment budget	3,20,00,000	3,20,00,000
(5) Funds required to be raised by new issue (4 – 3)	2,11,20,000	1,60,00,000
(6) Market price per share	125.12	131.52
(7) Number of new shares (5/6)	1,68,798	1,21,655

**Solution RQ.30.14**

$$P = \frac{D + \frac{r}{c}(E - D)}{C}$$

Desired  $P = \text{Rs } 42$ 

EPS (E) = (Rs 30,00,000 – Rs 12,00,000, dividend on preference shares)/No. of equity shares, 3 lakh = Rs 6.

Return on investment (r) = 20%

Cost of equity (C or  $k_e$ ) is not given. It is to be higher than 12 per cent (dividend on preference shares). It is assumed to be 15 per cent

Let us suppose, dividend payout ratio = X

$$\text{Rs } 42 = \frac{6X + \frac{0.20}{0.15}(\text{Rs } 6 - 6X)}{0.15}$$

$$\begin{aligned} 6.3 &= 6X + 4/3 (6 - 6X) \\ &= 6X + 8 - 8X \\ 6.3 - 8 &= -2X \\ X &= 1.7/2 = 0.85 \end{aligned}$$

The required dividend payout ratio is 85 per cent

Confirmation:

$$P = \frac{\text{Rs } 5.1 + \frac{0.20}{0.15}(\text{Rs } 6 - \text{Rs } 5.1)}{0.15}; D = \text{Rs } 6 \times 0.85 = \text{Rs } 5.1$$

$$P = \frac{\text{Rs } 5.1 + 4/3(0.9)}{0.15} = \frac{\text{Rs } 6.3}{0.15} = \text{Rs } 42$$

## CHAPTER 31

### ***Solution RQ.31.10***

(i) and (ii) *Determination of D/P ratio and P/E ratio of X Ltd and Y Ltd*

Year	X Ltd					Y Ltd				
	EPS	DPS	D/P ratio (DPS ÷ EPS) (per cent)	P	P/E ratio (P ÷ EPS) (Number of times)	EPS	DPS	D/P ratio (per cent)	P	P/E ratio (Number of times)
1	Rs 9.3	Rs 2	21.5	Rs 82.5	8.87	Rs 9.5	Rs1.9	20	Rs 70	7.37
2	7.4	2	27	67.5	9.12	7	1.4	20	45	6.43
3	10.5	2	19	90	8.57	10.5	2.1	20	57.5	5.48
4	12.75	2.25	17.6	110	8.63	12.25	2.45	20	100	8.16
5	20	2.5	12.5	167.5	8.37	20.25	4.05	20	167.5	8.27
6	16	2.5	15.6	170	10.62	17	3.4	20	160	9.41
7	19	2.5	13.2	182.5	9.6	20	4	20	160	8.00
	94.95	15.75	16.6	870	9.16	96.5	19.30	20	760	7.88

(iii) X Ltd is following a stable dividend policy, whereas Y Ltd is following constant D/P ratio policy. In the latter policy, sporadic dividend payments occur, which make its owners very uncertain about the returns they can expect from their investment in the firm and, therefore, generally depress the share prices. It is probably for this reason that X Ltd's average price per share exhibited a stable increasing behaviour vis-a-vis that of Y Ltd, volatile pattern of earnings of both companies (during the last three years), notwithstanding. Company Y is advised to follow a stable dividend policy.

## CHAPTER 32

### ***Solution RQ.32.13***

Determination of goodwill	(Rs.crore)
Future maintainable profit	Rs.14
Less: Normal profit (Rs 100 crore x 0.10)	10
Super profits	4
Multiplied by PV of annuity for 4 years at 10 per cent	x 3.17
Value of goodwill	12.68

### ***Solution RQ.32.14***

Valuation of business, value of equity and price per equity share (capitalization method)	(Rs.crore)
Profit before tax (30/(1-0.4))	Rs. 50
Less: Extraordinary income	8
Less: Additional advertisement expenditure	2
Expected earnings after taxes	40
Less taxes (0.40)	16
Future maintainable profits after taxes	24
Divided by relevant capitalization factor	0.12
Value of business	200
Value of equity (Rs.200crore – Rs.50crore external liabilities)	150
Price per equity share (Rs.150crore/1crore)	Rs.150

### ***Solution RQ.32.15***

Determination of Continuing Value	(Rs.crore)
Cash flow from business operations at the end of explicit forecast period (year 5)	Rs. 20
Investment required in current assets in year 5	2
Free cash flow to the firm in year 5 (FCFF <sub>5</sub> )	18
Continuing value = $FCFF_5 / [WACC - \text{growth rate}(g)]$	
= $FCFF_5(1+g) / (WACC - g)$	
= $18(1.05) / 0.12 - 0.05$	270

### ***Solution RQ.32.16***

Computation of Value of Corporate and Value of Equity			(Rs.crore)
Year end	FCFF	PV factor at 13%	Total PV
1	Rs. 400	0.885	Rs. 354.00
2	800	0.783	626.40
3	1,050	0.693	727.65
4	1,400	0.613	858.20
5	950	0.543	515.85
6	600	0.480	288.00
Continuing value (600/0.13)	4,615.38	0.480	2,215.38
Value of corporate			5,585.48
Less: External liabilities			2,400.00
Value of equity			3,185.48

**Solution RQ.32.17**

Computation of value of equity share using net assets method (book value) (Rs.crore)	
Book value of assets	580
Book value of external liabilities (150+35+15)	200
Book value of net assets	<u>380</u>
Value of equity share (Rs 360crore/1crore)	Rs 380

Computation of value of equity share using net assets method (market value) (Rs.crore)	
Market value of assets (180+300+80+60+40)	660
Market value of external liabilities (150+35+15)	200
Book value of net assets	<u>460</u>
Value of equity share (Rs.460crore/1crore)	Rs.460

**Solution RQ.32.18**

Determination of economic value added (EVA) (Rs.crore)	
Net operating profits before taxes (Earnings before taxes + interest)	40
Less taxes (0.40)	<u>16</u>
Net operating profits after taxes	24
Less: Cost of capital employed (150 x 0.12 WACC)	<u>18</u>
Economic value added	6

**Solution RQ.32.19**

- (i) Determination of net operating profit after taxes

Financial leverage =  $EBIT/(EBIT - I)$ 1.4 =  $EBIT/(EBIT - \text{Rs } 40 \text{ lakh (i.e. Rs 400 lakh debentures} \times 10\%))$ 

1.4 (EBIT – Rs 40 lakh) = EBIT

1.4 EBIT – Rs 56 lakh = EBIT

1.4 EBIT – EBIT = Rs 56 lakh

EBIT = Rs 56 lakh/0.4 = Rs 140 lakh

EBIT	Rs 140 lakh
Less taxes (Rs 140 lakh $\times$ 0.3)	<u>42 lakh</u>
Net operating profit after taxes	98 lakh

- (ii) Determination of weighted average cost of capital (
- $K_0$
- )

Particulars	Amount	Cost (%)	Total cost
Equity funds	Rs 300 lakh	17.5%	Rs 52.5 lakh
10% Debt	<u>400</u>	7.0%*	<u>28.0</u>
	Rs 700		70.5

$$K_0 = (\text{Rs } 70.5 \text{ lakh} / \text{Rs } 700 \text{ lakh}) \times 100 = 11.5\%$$

$$* K_d = 10\% (1 - 03) = 7\%$$

- (iii) Determination of EVA

$$\text{Net operating profits after taxes} - (K_0 \times \text{capital employed}) = \text{Rs } 98 \text{ lakh} - (11.5\% \times \text{Rs } 700 \text{ lakh} = 80.5 \text{ lakh}) = \text{Rs } 17.5 \text{ lakh}$$

## CHAPTER 33

### **Solution RQ.33.19**

(i) *Shares required to be issued by AB Ltd:* Shares of CD Ltd (×) Exchange ratio = 20,000 × 0.8 = 16,000.

(ii) *Exchange ratio based on market prices:* Market price per share of CD Ltd/Market price per share of AB Ltd = Rs 8/Rs 20 = 0.4.

For every 10 shares of CD Ltd, 4 shares of AB Ltd would be issued.

(iii) *P/E ratio of the companies (before merger)*

	<i>AB Ltd</i>	<i>CD Ltd</i>
Market price per share	Rs 20	Rs 8
EPS	2	1
P/E ratio	10	8

(iv) *EPS after acquisition*

(a) Exchange ratio 0.8 = (Rs 1,00,000 + Rs 20,000)/(50,000 + 16,000) = Rs 1.82

(b) Exchange ratio 0.4 = (Rs 1,00,000 + Rs 20,000)/(50,000 + 8,000) = Rs 2.069

(v) Equivalent EPS per share of CD Ltd = (EPS after the acquisition × exchange ratio) = Rs 1.82 × 0.8 = Rs 1.45.

(vi) *Gain from the merger*

Post-merger market value of the firm (Post-merger earnings × P/E ratio of AB Ltd)	Rs 12,00,000
Less pre-merger market values	
AB Ltd (50,000 × Rs 20 =	Rs 10,00,000
CD Ltd (20,000 × Rs 8 =	1,60,000
	<u>11,60,000</u>
	40,000

*Apportionment of gains between shareholders of the two companies*

<i>Particulars</i>	<i>Exchange ratio 0.8</i>		<i>Exchange ratio 0.4</i>	
	<i>AB Ltd</i>	<i>CD Ltd</i>	<i>AB Ltd</i>	<i>CD Ltd</i>
Post-merger value	Rs 9,09,091 <sup>1</sup>	Rs 2,90,909 <sup>2</sup>	Rs 10,34,483 <sup>3</sup>	Rs 1,65,517 <sup>4</sup>
Less pre-merger value	<u>10,00,000</u>	<u>1,60,000</u>	<u>10,00,000</u>	<u>1,60,000</u>
Gain (Loss)	(90,909)	1,30,909	34,483	5,517

<sup>1</sup>12,00,000 × 50/66; <sup>2</sup>12,00,000 × 16/66; <sup>3</sup>12,00,000 × 50/58; <sup>4</sup>12,00,000 × 8/58

### **Solution RQ.33.20**

The number of required shares = (Excess post-merger earnings × P/E ratio)/Share price of acquiring firm

Year 1 : (Rs 3 lakh × 10)/100 = 30,000

2 : (Rs 5 lakh × 10)/100 = 50,000

3 : (Rs 10 lakh × 10)/100 = 1,00,000

### **Solution RQ.33.21**

*PV of tax savings (benefit) to Strong Ltd. (Rs lakh)*

<i>Year</i>	<i>Tax savings</i>	<i>PV factor at 0.15</i>	<i>Total PV</i>
1	20 × 0.35 = 7	0.870	6.1
2	5 × 0.35 = 1.75	0.756	<u>1.3</u>
			7.4

**Solution RQ.33.22**(i) *Market value of companies before merger*

	<i>RIL</i>	<i>SIL</i>
EPS	Rs 2	Re 1
Multiplied by P/E ratio	10	<u>5</u>
Market price per share	20	5
Multiplied by equity shares outstanding	<u>10,00,000</u>	<u>10,00,000</u>
Total market value	2,00,00,000	50,00,000

(ii) *Post-merger effects on RIL*

Post-merger earnings		Rs 30,00,000
Divide by the number of equity shares outstanding (exchange ratio of 1:4)		12,50,000
EPS		2.4
Multiply by P/E ratio		<u>10</u>
Market price per share		24
Market value		3,00,00,000
Gain from the merger		<u>3,00,00,000</u>
Post-merger market value of the firm		3,00,00,000
Less pre-merger market value		
RIL	Rs 2,00,00,000	
SIL	<u>50,00,000</u>	<u>2,50,00,000</u>
Total gain from merger		50,00,000

*Apportionment of gains between the shareholders*

	<i>RIL</i>	<i>SIL</i>
Post-merger market value	Rs 2,40,00,000*	Rs 60,00,000**
Less pre-merger market value	<u>2,00,00,000</u>	<u>50,00,000</u>
Gain	40,00,000	10,00,000

\*10,00,000 × 24

\*\*Rs 2,50,00 × 24

The shareholders of both the companies are better off.

(iii) Post-merger earnings	Rs 33,00,000
Divide by the number of equity shares outstanding	<u>12,50,000</u>
EPS	2.64
Multiplied by P/E ratio	<u>10</u>
Market price per share	26.40

The shareholders will be better-off than before the merger.

**Solution RQ.33.23**

(i) True cost of merger = Rs 240 lakh – Rs 180 lakh = Rs 60 lakh

(ii) New share price = (Rs 1,500 lakh + Rs 180 lakh + Rs 94.80 lakh)/11,60,000 shares = Rs 153.

True cost of merger = (1,60,000 shares × Rs 153) – Rs 180 lakh = Rs 64.80 lakh.

## CHAPTER 34

### **Solution RQ.34.12**

A quote of Rs/US \$ : 47.9450/9550 implies in bid-ask form as Rs/US \$ : Rs 47.9450 – 47.9550.

- (a) As importer is to buy dollars, the relevant rate for the importer is Rs 47.9550/US \$ (selling rate of the dealer) so, to buy US \$ 10,000, the importer will pay (US\$ 10,000 × Rs 47.9550) = Rs 4,79,550.
- (b) In this case, an exporter is to sell dollars, the relevant rate for the exporter is Rs 47.9450/US \$ (buying rate of the dealer) so, by selling US \$ 10,000 the exporter will receive (US\$ 10,000 × Rs 47.9450) = Rs 4,79,450.

### **Solution RQ.34.13**

Rs/US \$ : 48.8450 – 48.8900

Now, (US \$/Rs)<sub>bid</sub> = 1/(Rs/US \$)<sub>ask</sub> = 1/48.8900 = 0.02040

(US \$/Rs)<sub>ask</sub> = 1/(Rs/US \$)<sub>bid</sub> = 1/48.8450 = 0.0205

So, the direct quote of rupee in New York (US \$/Rs) : 0.0204 – 0.0205.

### **Solution RQ.34.14**

Cross rate of (Singapore \$/US \$) using quotes at Mumbai is :

Singapore \$/US \$ = (Singapore \$/Rs) × (Rs/US \$) = 1/28.5000 × Rs 48.3610 = 1.6969

Direct quote of US \$ in Singapore is 1.7470, since rates are different, profit can be made by buying US\$ using cross rate and selling it in Singapore. Arbitrage process will involve the following steps:

- (i) Sell 1 million Singaporean \$ and get rupees in Mumbai. The proceeds will be Rs 1,000,000 × 28.50 = Rs 28,500,000.
  - (ii) Sell Rs 2,85,00,000 in Mumbai and get US \$. The proceeds will be  

$$\text{US \$ } 2,85,00,000 \times 1/48.3610 = \text{US \$ } 5,89,318$$
  - (iii) Sell US \$ 5,89,318 in Singapore to receive Singapore \$ (5,89,318 × 1.7470) = Singapore \$ 1,029,538.
- Thus, there is a gain of (Singapore \$ 1,029,538 – \$1,000,000) = Singapore \$ 29,538.

### **Solution RQ.34.15**

Maturity	Bid	Ask	Spread
Spot	Rs 48.9350/\$	Rs 48.9550/\$	Re 0.0200
1 month forward	48.9575/\$	48.9825/\$	0.0250
3 month forward	48.9750/\$	49.0200/\$	0.0450

### **Solution RQ.34.16**

$$1 \text{ month forward premium} = \frac{\text{Rs } 48.9300 - \text{Rs } 48.8750}{\text{Rs } 48.8750} \times \frac{12}{1} \times 100 = 1.35\% \text{ per annum}$$

$$6 \text{ month forward premium} = \frac{\text{Rs } 49.1050 - \text{Rs } 48.8750}{\text{Rs } 48.8750} \times \frac{12}{6} \times 100 = 0.94\% \text{ per annum}$$

### **Solution RQ.34.17(a)**

Maturity	Bid	Ask
Spot	Rs 47.6500/\$	Rs 47.6595/\$
1 month forward	47.6475/\$	47.6575/\$ <sup>@</sup>
3 month forward	47.6460/\$	47.6563/\$
6 month forward	47.6520/\$	47.6621/\$ <sup>@@</sup>

@ Swap points 25/20 are in decreasing order, implying forward rates are at discount. Therefore, these swap points have been deducted from the spot.

@@ Swap points 20/26 are in increasing order, implying forward rate is at premium. Therefore, swap points have been added in the spot rate.

***Solution RQ.34.17(b)***

To find out a quote for the 2 month forward, the process of interpolation will be used between 1 month and 3 month quote, as follows:

$$\text{Bid} = \frac{\text{Rs } 47.6460 + \text{Rs } 47.6475}{2} = \text{Rs } 47.6467$$

$$\text{Ask} = \frac{\text{Rs } 47.6563 + \text{Rs } 47.6575}{2} = \text{Rs } 47.6569$$

Therefore, the 2 month forward rate will be Rs 47.6467/\$ – Rs 47.6569/\$.

***Solution RQ.34.18***

Here the interest rate differential = 7.5% – 2.0 % = 5.5% pa. So for no arbitrage, the forward premium differential must be same.

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Spot rate	Rs 48.00
Add 5.5% premium for 3 month $[48 \times (5.5/100) \times (3/12)]$	0.66
Forward rate	Rs 48.66/\$

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## CHAPTER 35

### ***Solution RQ.35.17***

The various methods available to X Company Limited, an Indian company, to hedge against this foreign currency exposure are forward contract, foreign currency options and money market operations. These are now explained.

- (i) **Forward Contract:** X Company Limited can enter into a forward contract for a period of 6 months for full payment of 3 million dollars to hedge its risk. Suppose it enters into a contract with a bank to buy US dollar at the forward rate of Rs 48/US \$ and after 6 months the actual exchange rate turns out to be Rs 49/US \$. Under the forward contract, X Limited has to pay Rs 1440 lakh (US\$ 3 million  $\times$  Rs 48) and without the forward contract the cost would be higher at Rs 1,470 lakh (\$3 million  $\times$  Rs 49). So by taking the forward cover X Limited is able to save Rs 30 lakh.
- (ii) **Foreign currency option:** Foreign currency option is a right but not an obligation to buy or sell a currency at an agreed exchange rate on or before an agreed maturity period. The right to buy is called a call option and the right to sell is a put option. The option holder will exercise his right only if it is beneficial for him. X Limited can purchase a 6 months call option, say, at an agreed rate of Rs 48.10/US \$ plus a premium of 3 per cent. So, in this case the actual cost is US\$ 30 lakh  $\times$  Rs 48.1  $\times$  1.03 = Rs 1486.29 lakh. Suppose, after 6 months the actual exchange rate is Rs 49/US \$. In this case, X Limited will exercise its call option and purchase the dollar at the rate of Rs 48.1/US \$ instead of Rs 49/US \$. In the absence of a call option, actual costs are to be higher (Rs 1,490 lakh plus the premium sum already paid Rs 43.209 lakh = Rs 1533.209 lakh). Therefore, by exercising the call option a loss of Rs 46.919 can be avoided, i.e., (Rs 1533.209 lakh – Rs 1486.29 lakh).

In case after 6 months the exchange rate is Rs 47.5/US \$, instead of exercising the option X Limited can purchase the dollars from the market at the rate of Rs 47.5 /US \$. In this case its total costs (Rs 47.5  $\times$  \$ 30 lakh) + premium already paid Rs 43.209) = Rs 1468.209 lakh. So X Limited gains from not exercising the option.

- (iii) **Money Market Operations:** X Company can also hedge its risk through money market operations. For this purpose, let us assume the following data:

6 month interest rate :	US dollar	4.5 % p.a.
	Rupee	7.5% p.a.
	Spot exchange rate	Rs 48/\$

X Company will take the following steps:

- (i) Buy an A amount of dollars and place this amount in the money market for 6 months at the rate of 4.5 per cent per annum. The bought amount should be such that it should become 30 lakh dollars, including interest, after 6 months.

Thus,  $A [1 + (0.045 \times 6/12)] = \text{US\$ } 3,000,000$

$$A = \text{US\$ } 3,000,000 / (1 + 0.0225) = \text{US\$ } 2,933,985.33$$

In order to buy this amount of dollars in the spot market, the sum of rupees required is (Rs 48  $\times$  US\$ 2,933,985.33) = Rs 140.831 million. This sum can be borrowed @ 7.5 per cent per annum for 6 months.

- (ii) The dollar amount bought from the spot exchange market is placed in the money market for 6 months. At the end of 6 months it would become US\$ 3,000,000, including interest. This sum is paid on the due date.

- (iii) Refund the rupee loan alongwith interest after 6 months. This is Rs 140.831 million  $(1 + 0.075 \times 6/12)$  = Rs 146.112 million.

Thus the company has been able to know that it has to pay a sum of Rs 146.112 million.

### ***Solution RQ.35.18***

**Premium paid:** The Indian exporter will be interested in ensuring that his receivables do not lose too much value due to expected depreciation of the dollar. So he buys a put option and pays the premium amount right away. The sum paid as premium is US\$ 10 million  $\times$  0.02  $\times$  Rs 48.50 = Rs 9.7 million.

**Possibilities:** On the maturity date, the following possibilities may be considered.

- (i) The *US dollar depreciates* to Rs 47.50/\$. In this situation, the exporter will exercise his put option and sell his US\$ 10 million to the writer of the option. Thus, his total inflow in rupees will be (US\$ 10 million  $\times$  48.10) – Premium already paid = Rs 481 million – Rs 9.7 million = Rs 471.3 million.
- (ii) The *US dollar depreciates* to Rs 48.10/\$, which is the same as the strike price of the put option held by exporter. In this case, he is indifferent/netural between the use of his put option or its non-use. In this his inflows in rupees will be (US\$ 10 million  $\times$  48.10) – Premium already paid = Rs 481 million – Rs 9.7 million = Rs 471.3 million.
- (iii) The *US dollar appreciates* to Rs 49/\$ on settlement day. Now the exporter abandons his put option and sells US\$ 10 million directly in the forex market. In such an event the net cash inflows in rupees will be (US\$ 10 million  $\times$  49) – Premium already paid = Rs 490 million – Rs 9.7 million = Rs 480.3 million.

It is evident that the Indian exporter's minimum receipts are Rs 471.3 million, irrespective of actual spot rate on the date of settlement; he benefits from the favourable exchange rate of the US dollar (rupee receipts are higher at Rs 480.3 million).

### Solution RQ.35.19

In the case of an appreciation of the Deutschmark (i.e., higher than Rs 22.60/DM), the company will exercise call option, the net price to be paid by the company is going to be Rs 22.60 + Premium paid = Rs 22.60 + (0.03  $\times$  Rs 22.10) = Rs 23.263/DM.

Therefore, the total outflow will be Rs 23.263  $\times$  1 million DM = Rs 23.263 million.

Since the spot rate is lower than Rs 22.10, the exercise price, it will be profitable for the company to buy the DM directly from the spot market. Total cash outflow will be

$$[(Rs\ 21.92 \times 1\ \text{million DM}) + (Rs\ 0.663\ \text{premium per DM} \times 1\ \text{million DM})] = Rs\ 22.583\ \text{million}.$$

The company will not exercise the call option as it will cause less payments (at Rs 22.583 million), on buying the DM from the spot market, compared to Rs 23.263 million (in the case of call option).

### Solution RQ.35.20

#### Revenue for Eureka if it remains unhedged

Here Eureka will be converting its £ 50,000 revenue in rupees by using the applicable spot rate (after 90 days).

Possible spot rate after 3 months	Rupee received by selling £ 50,000	Probability
Rs 76/£	Rs 38,00,000	5%
75.5/£	37,75,000	10%
75.0/£	37,50,000	20%
74.5/£	37,25,000	20%
74.0/£	37,00,000	20%
73.5/£	36,75,000	15%
73.0/£	36,50,000	10%

Revenue for Eureka if it hedges through option purchase put of exercise price Rs 74.75/£ (assuming settlement date of option to be the day on which Eureka receives its sterling pond revenue).

Possible spot rate after 90 days	Premium paid per unit for put option	Exercise option	Total price received per unit	Total rupee received for Rs 50,000	Probability
Rs 76	Rs 0.55	No	Rs 75.45	Rs 37,72,500	5%
75.5	0.55	No	74.95	37,47,500	10%
75.0	0.55	No	74.45	37,22,500	20%
74.5	0.55	Yes	74.20	37,10,000	20%
74.0	0.55	Yes	74.20	37,10,000	20%
73.5	0.55	Yes	74.20	37,10,000	15%
73.0	0.55	Yes	74.20	37,10,000	10%

**Solution RQ.35.21**

- (a) As the spot rate (Rs 47.7650/US \$) is less than the strike rate (Rs 48/US \$), the call option is out-of-money.
- (b) The intrinsic value of a call option =  $\text{Max}[(\text{Spot rate} - \text{Strike rate}), 0] = \text{Max}(-\text{Rs } 0.235/\text{US } \$, 0) = 0$ .
- (c) Profit from the call option =  $\text{Max}[(\text{Settlement rate} - \text{Strike rate}), 0] - \text{Premium} = \text{Max}[(\text{Rs } 0.352/\text{US } \$, 0) - \text{Rs } 0.2500/\text{US } \$] = \text{Rs } 0.352/\text{US } \$ - \text{Rs } 0.2500/\text{US } \$ = \text{Rs } 0.102/\text{US } \$$ .

**Hint:** As the settlement rate is higher than the strike rate, the call option will be exercised giving a value of (settlement rate – strike rate). And the premium is the cost incurred in buying the option.

$$\text{Return on investment} = (0.102/0.2500) \times 100 = 40.8 \text{ per cent per month.}$$

## CHAPTER 36

### ***Solution RQ36.11***

As the company wants a 200 basis point premium over its cost of capital of 8 per cent, all cash flows will be discounted by 10 per cent (8 per cent + 2 per cent) for assessing the financial viability of the proposal.

*Determination of PV of cash outflows at  $t = 0$*

Year	Particulars	Cash outlays	PV factor	Total PV
	(i) Land			
0	Cash payment	Rs 3,00,000	1.000	Rs 3,00,000
1	Instalment 1	2,00,000	0.909	1,81,800
2	Instalment 2	2,00,000	0.826	1,65,200
	(ii) Factory building			
2	Instalment 1	6,00,000	0.826	4,95,600
3	Instalment 2	6,00,000	0.751	4,50,600
3	(iii) Equipment cost	12,00,000	0.751	9,01,200
4	(iv) Net working capital	16,00,000	0.683	10,92,800
Total present value				35,87,200

*Cash inflows ( $t = 5-16$ )*

Sales revenues		Rs 28,00,000
Less costs		
Variable operating costs	Rs 10,00,000	
Fixed operating costs	2,00,000	
Depreciation [(Rs 24,00,000 – 6,00,000) $\div$ 12]	1,50,000	13,50,000
Earnings before taxes		14,50,000
Less taxes		5,07,500
EAT		9,42,500
Plus depreciation		1,50,000
(a) CFAT ( $t = 5-15$ )		10,92,500
(b) CFAT ( $t = 16$ )	Rs 10,92,500	
Add sale of building	6,00,000	
Add sale of land	8,00,000	
Add recovery of working capital	16,00,000	40,92,500

*Determination of PV of CFAT at the start of year 5*

Year	Total time period	CFAT	PV factor	Total PV
5–15	11 years	Rs 10,92,500	6.495	Rs 70,95,787
16	12th year	40,92,500	0.319	13,05,508
Total PV				84,01,295
PV at $t = 0$ (4 years before) = (Rs 84,01,285 $\times$ 0.683)				57,38,084
Less PV of cash outflows				35,87,200
NPV				21,50,884

**Recommendation:** The company should accept the project.

### ***Solution RQ36.12***

(i) Cash outflow at  $t = 0$

In dollar terms

\$ 50,000

In rupee terms	Rs 2,400,000
(ii) Cash inflow $t = 1$ to 5	
EAT	\$ 5,000
Add depreciation:	\$ 10,000
CFAT (1–5)	\$ 15,000

Year	CFAT (\$)	Exchange rate	CFAT (Rs)	Cumulative CFAT
1	15,000	Re 48/\$	Rs 720,000	720,000
2	15,000	48.50/\$	727,500	1,447,500
3	15,000	48.50/\$	727,500	2,175,000
4	15,000	48.50/\$	727,500	2,902,500
5	15,000	49.00/\$	735,000	3,637,500

(iii) Pay back period

From col. (5) in above table, it is evident that the pay back period is in between 3 and 4 years or more precisely  $3 + 2,400,000 - 2,175,000 / 2,902,500 - 2,175,000 = 3.3$  years.

(iv) Internal Rate of Return

$$\text{Rs } 2,400,000 = \frac{\text{Rs } 720,000}{(1+r)^1} + \frac{\text{Rs } 727,500}{(1+r)^2} + \frac{\text{Rs } 727,500}{(1+r)^3} + \frac{\text{Rs } 727,500}{(1+r)^4} + \frac{\text{Rs } 735,000}{(1+r)^5}$$

$r = 14$  per cent

**Recommendation:** The project is profitable as  $\text{IRR} > K$ .

### Solution RQ.36.13

$$K_d = K_i(i + r) + r$$

Here,  $K_i$  is the coupon rate of interest in the foreign country where the debt has been issued.

$r$  is the appreciation/revaluation of foreign currency.

\$  $K_d$  is the effective rate of interest expressed in the home currency of the company.

So,  $K_d = 0.04 (1.02) + 0.02 = 0.068$

Or, the effective rate of interest for the Indian software company is 6.8 per cent.