Leverages Notes

Concept 1: Income Statement

Sales	XXX
(-) Variable Cost	- XXX
Contribution	XXX
(-) Fixed Cost	- XXX
Earnings Before Interest & Tax (EBIT)	Operating Profit
(-) Interest	XXX
Earnings Before Tax (EBT)	-XXX
(-) Tax (e.g., 30%)	XXX

Earnings After Tax (EAT)	XXX
(-) Preference Dividend	-XXX
Earnings Available to Equity Shareholders (EAES)	XXX
No. of Shares	XXX
Earnings Per Share (EPS)	EAES / No. of Shares

Dividend Distributed	-XXX
Retained Earnings	XXX

Concept 2: Before Tax to After Tax Conversion

Formula:
1. **After Tax Amount = Before Tax Amount * (1 - t)**
2. **After-Tax Amount ÷ (1 - Tax Rate) = Before-Tax Amount**

Example: Profit Before Tax = 1,00,000, Tax = 30%
Profit After Tax = 1,00,000 * (1 - 0.3) = 70,000

Concept 3: Impact of Preference Dividend on Tax

- Preference Dividend is paid after tax deduction, making it costlier.
- To understand its actual impact, it should be converted into a pre-tax equivalent.

Concept 4: Leverages as a Measure of Risk

Degree of Operating Leverage (DOL)	**Degree of Financial Leverage (DFL)**	**Degree of Combined Leverage (DCL)**
Measures the risk of Operating Fixed Costs	Measures the risk of Financial Fixed Costs	Measures Total Risk (Operating + Financial)
Formula	**Formula**	**Formula**

Note - Financial Leverage Ratio = Debt / Equity

Concept 5: Calculation of Percentage Change

Formula	Application
{Change in Value /Original Value} ×100	Used to calculate the percentage change in Sales, Contribution, EBIT, or EPS

Concept 6 : Profit-Volume Ratio (P/V Ratio)

Formula	Explanation
P/V Ratio = Contribution / Sales	Measures the relationship between contribution & sales.
P/V Ratio + Variable Cost Ratio = 100%	The sum of P/V Ratio & Variable Cost Ratio is always 100%.

Concept 7: Asset Turnover Ratio

Formula	Interpretation
Asset Turnover Ratio = Sales / Total Assets	Higher Asset Turnover indicates better asset utilization.

Concept 8: Balance Sheet Equation

- Both sides of a Balance Sheet must always be equal:
- **Total Assets=Total Liabilities (including Equity)**

If we know Total Liabilities, we can determine Total Assets.

Concept 9: Return on Investment (ROI), ROE & ROCE

Return on Investment (ROI) Or Return on Capital Employed (ROCE)	Return on Shareholders funds/ Return on Proprietors funds / Return on Net worth	Return on Equity (ROE)
Measures profitability of total investments.	Measures efficiency of share capital usage.	Measures return earned on equity capital.

General Note -

	Indian System		Western System
Thousand	1,000	**Thousand**	1,000
Lakh	1,00,000	**Million**	1000,000
Crore	1,00,00,000	**Billion**	1,000,000,000

Concept 10: Trading on Equity

Trading on Equity - When a company earns more by using low-cost funds like debt or preference shares.
Favorable Financial Leverage - When the cost of debt is lower than the return on investment, leading to higher equity earnings.

Unfavorable Financial Leverage - When the cost of debt is higher than the return on investment, reducing equity earnings.

Concept 11: Break-Even Point (BEP)

Operating BEP	Financial BEP	Combined BEP
The level of sales required to cover all **fixed operating costs**.	The level of EBIT required to cover **interest & fixed financial costs**.	The point at which **EPS becomes zero**, meaning no profit or loss for equity shareholders.

Concept 12: Missing Figures in Questions

- If **DOL, DFL, or DCL** is given in a question but **not required**, be cautious.
- If your **calculations match** the given values, it's just additional information.
- If your **calculations do not match**, then a figure might be **missing**, and further verification is needed.

Concept 13: Relationship Between MOS & DOL

Operating Leverage & Margin of safety have an **inverse relationship**.

DOL = 1/ MOS

Concept 14: Shortcut for Finding EPS

EPS = {(EBIT - Interest) (1 - Tax Rate) - Pref Div } / No. of Equity Shares

Concept 15: Segments of Return on Equity (ROE)

ROE = Segment of equity earnings on Equity funds +
Segment of equity earnings on Pref funds +
Segment of equity earnings on Debt funds

ROE = E/E (ROI × (1 - Tax Rate)) + P/E (ROI × (1 - Tax Rate) - PD) + D/E (ROI - Interest) (1 - Tax Rate)

Question 1 : (MTP April 2024)

From the following PREPARE Income statement of company P and Q.

	P	Q
No. of Equity Shares	1,00,000	70,000
Financial leverage	3 : 1	4 : 1
Operating Leverage	2 : 1	3 : 1
Variable cost to sales	67%	50%
Interest	₹ 5,50,000	₹ 6,00,000
Income tax rate	30%	30%

Also CALCULATE EPS of the company.

Solution 1 :

Income statement

	Particulars	P	Q
		(₹)	(₹)
	Sales	50,00,000	48,00,000
(–)	Variable Cost	33,50,000	24,00,000
	Contribution	16,50,000	24,00,000
	Fixed Cost	8,25,000	16,00,000
	EBIT	8,25,000	8,00,000
(–)	Interest	5,50,000	6,00,000
	EBT	2,75,000	2,00,000
(–)	Tax	82,500	60,000
	EAT	1,92,500	1,40,000
(÷)	No. of Shares	1,00,000	70,000
	EPS	₹ 1.93	₹ 2.00

Working Note :

1. Financial Leverage	=	**EBIT / EBT**	=	**EBIT / (EBIT – Int.)**

Let the EBIT be X

	P	Q
	3 = X/(X – 5,50,000) 3(X – 5,50,000) = X 3X – 16,50,000 = X 2X = 16,50,000	4 = X/(X – 6,00,000) 4(X – 6,00,000) = X 4X – 24,00,000 = X 3X = 24,00,000
	X = 8,25,000	**X = 8,00,000**

2. Operating Leverage = Contribution/EBIT

Let the Contribution be X

	P	Q
	2 = X/8,25,000	3= X/8,00,000
	X = 16,50,000	X = 24,00,000

3. Sales

Let the Sales be 100

Sales – Variable Cost = Contribution

	P		Q
Contribution =	100 – 67	=	100 – 50
=	33	=	50
Sales =			
	P		**Q**
For 33	= 16,50,000	For 50	= 24,00,000
For 100	= **50,00,000**	For 100	= **48,00,000**

Question 2 :(MTP October 2023)

The capital structure of AB Ltd. for the year ended 31st March, 2023 consisted as follows:

Particulars	Amount in ₹
Equity share capital (face value ₹ 100 each)	20,00,000
10% debentures (₹ 100 each)	10,00,000

During the year 2022-23, sales decreased to 2,00,000 units as compared to 2,20,000 units in the previous year. However, the selling price stood at ₹ 10 per unit and variable cost at ₹ 6 per unit for both the years. The fixed expenses were at ₹ 4,00,000 p.a. and the income tax rate is 30%.

You are required to CALCULATE the following:

(i) The degree of financial leverage at 2,20,000 units and 2,00,000 units.

(ii) The degree of operating leverage at 2,20,000 units and 2,00,000 units.

(iii) The percentage change in EPS.

Solution 2 :

Income Statement with required calculations

Particulars	**(₹)**	**(₹)**
Sales in units	2,20,000	2,00,000
Sales Value	22,00,000	20,00,000
Variable Cost	(13,20,000)	(12,00,000)
Contribution	8,80,000	8,00,000
Fixed expenses	(4,00,000)	(4,00,000)
EBIT	4,80,000	4,00,000
Debenture Interest	(1,00,000)	(1,00,000)
EBT	3,80,000	3,00,000
Tax @ 30%	(1,14,000)	(90,000)
Profit after tax (PAT)	2,66,000	2,10,000
No. of shares	20,000	20,000
(i) Financial Leverage $\frac{EBIT}{EBT}$	$= \frac{₹4,80,000}{₹3,80,000}$ = 1.26	$= \frac{₹4,00,000}{₹3,00,000}$ = 1.33
(i) Operating Leverage $\frac{Contribution}{EBIT}$	$= \frac{₹8,80,000}{₹4,80,000}$ = 1.83	$= \frac{₹8,00,000}{₹4,00,000}$ = 2
(iii) Earnings per share (EPS) $= \frac{PAT}{No.\ of\ Shares}$	$= \frac{₹2,66,000}{20,000}$ = ₹ 13.3	$= \frac{₹2,10,000}{20,000}$ = ₹ 10.5
Decrease in EPS	= ₹ 13.3 – ₹ 10.5 = ₹ 2.8	
% decrease in EPS	$= \frac{2.8}{13.3} \times 100$ = 21.05%	

Question 3 : (Nov 2023)

The following details of Shiva Ltd. for the year ended 31 st March,2023 are given below:

Operating Leverage	1.4
Combined Leverage	2.8
Fixed Cost (Excluding Interest)	₹ 2.04 lakhs
Sales	₹ 30 lakhs
12% Debentures of ₹ 10 each	₹ 21.25 lakhs
Equity Share Capital of ₹ 10 each	₹ 17.00 lakhs
Income Tax Rate	30%

Required:

(i) Calculate P/V ratio and Earning Per Share (EPS)

(ii) If the company belongs to an industry, whose assets turnover is 1.5, does it have a high or low assets turnover?

(iii) Financial Leverage

Solution 3 :

(i) P/V Ratio and Earning per share (EPS)

Operating leverage $= \frac{Contribution\ (C)}{Contribution - Fixed\ Cost(FC)}$

1.4 $= \frac{C}{C-2,04,000}$
Or, C = 1.4 (C – 2,04,000)
Or, C = 1.4 C – 2,85,600
Or, Contribution = ₹ 7,14,000
Now, P/V ratio $= \frac{Contribution\ (C)}{Sales\ (S)} \times 100 = \frac{7,14,000}{30,00,000} \times 100 = 23.8\%$
Therefore, P/V Ratio = 23.80%
EBT = Contribution – Fixed Cost – Interest
= ₹ 7,14,000 – ₹ 2,04,000 – (12% × ₹ 21,25,000)
= ₹ 5,10,000 – ₹ 2,55,000
= ₹ 2,55,000
PAT = EBT(1-T) = ₹ 2,55,000(1-0.3) = ₹ 1,78,500
EPS $= \frac{Profit\ after\ tax}{No.\ of\ Equity\ shares}$
EPS $= \frac{₹1,78,500}{1,70,000\ shares}$ = ₹ 1.05

(ii) Assets turnover

Assets turnover $= \frac{Sales}{Total\ Assets^*} = \frac{₹30,00,000}{₹17,00,000+₹21,25,000}$ = 0 .7843
0.7843 < 1.5 means lower than industry turnover.
*Total Asset = Equity share capital + 12% Debentures

(iii) Financial leverage

Combined Leverage = Operating Leverage (OL) x Financial Leverage (FL)
2.8 = 1.4 x FL
Or, FL = 2
Financial Leverage = 2

Question 4 : (May 2024)

Alpha Limited has provided following information:

Equity Share Capital	25,000 Shares @ ₹100 per share
15% Debentures	10,000 Debentures @ ₹750/- per Debenture
Sales	50 Lakhs units @ ₹20 per unit
Variable Cost	₹12.50 per unit
Fixed Costs	₹175.00 Lakhs

Due to recent policy changes and entry of foreign competitors in the sector, Alpha Limited expects the sales may decline by 15-20%, However, selling price and other costs will remain the same. Corporate Taxes will continue @ 20%.
You are required to calculate the decrease in Earnings per share, Degree of Operating Leverage and Financial Leverage separately if sales are declined by (i) 15% ; and (ii) 20%.

Solution 4 :

Income Statement with required calculations

Particulars	**(₹)**	**(₹)**	**(₹)**
	Existing	**Sales declined by 15%**	**Sales declined by 20%**
Sales in units	50,00,000	42,50,000	40,00,000
Sales price per unit	20	20	20
Variable Cost per unit	(12.50)	(12.50)	(12.50)
Contribution per unit	7.5	7.5	7.5
Contribution	3,75,00,000	3,18,75,000	3,00,00,000
Fixed expenses	(1,75,00,000)	(1,75,00,000)	(1,75,00,000)
EBIT	2,00,00,000	1,43,75,000	1,25,00,000
Debenture Interest	(11,25,000)	(11,25,000)	(11,25,000)
EBT	1,88,75,000	1,32,50,000	1,13,75,000
Tax @ 20%	(37,75,000)	(26,50,000)	(22,75,000)
Profit after tax (PAT)	1,51,00,000	1,06,00,000	91,00,000
No. of shares	25,000	25,000	25,000
Earnings per share (EPS) $= \frac{PAT}{No.\ of\ shares}$	$\frac{₹1,51,00,000}{25,000}$ = ₹604	$\frac{₹1,06,00,000}{25,000}$ =₹424	$\frac{₹91,00,000}{25,000}$ =₹364

(i) Decrease in EPS		=₹180 Or %Decrease in EPS = $\frac{180}{604} \times 100$ =29.80%	= ₹240 Or % Decrease in EPS = $\frac{240}{604} \times 100$ = 39.73%
(ii) Operating leverage = $\frac{Contribution}{EBIT}$ Degree of Operating Leverage = $\frac{Percentage\ change\ in\ EBIT}{Percentage\ change\ in\ sales}$		=$\frac{₹3,18,75,000}{₹1,43,75,000}$=2.22 Or 28.125/15=1.875	=$\frac{₹3,00,00,000}{₹1,25,00,000}$=2.40 Or 37.50/20 = 1.875
(iii) Financial Leverage = $\frac{EBIT}{EBT}$ Or Degree of Financial Leverage = $\frac{Percentage\ change\ in\ EPS}{Percentage\ change\ in\ EBIT}$		=$\frac{₹1,43,75,000}{₹1,32,50,000}$=1.08 Or 29.80/28.125 = 1.06	=$\frac{₹1,25,00,000}{₹1,13,75,000}$=1.10 Or 39.735/37.50 =1.06

Question 5 : (Sept 2024)

Financial information for the year 2023-24 of two companies, N Limited and C Limited are as under:

Details	N Limited	C Limited
Equity share capital (₹ 100 each)	₹ 10,00,000	₹ 8,00,000
Debt	₹ 5,00,000@10%	₹ 7,00,000@8%
Fixed Cost	3,00,000	3,36,000
Combined Leverage	8	4.5
Financial Leverage	2	1.5

You are required to calculate:

(i) Contribution for N Ltd. and C Ltd.

(ii) Margin of safety in % for N Ltd. and C. Ltd.

(iii) Sales of C Ltd.

Solution 5 :

(a) (i) **Calculation of Contribution**

N Limited	C Limited
Financial Leverage (FL) = $\frac{EBIT}{EBT}$ or $\frac{EBIT}{EBIT - Interest}$	
2 = $\frac{EBIT}{EBIT - 50,000}$	1.5 = $\frac{EBIT}{EBIT - 56,000}$
2 EBIT – 1,00,000 = EBIT	1.5 EBIT – 84,000 = EBIT
EBIT = ₹ 1,00,000	**EBIT = ₹ 1,68,000**
EBT = ₹ 50,000	EBT = ₹ 1,12,000
Combined Leverage (CL) = $\frac{Contribution}{EBT}$	
8 = Contribution / 50,000	4.5 = Contribution / 1,12,000
Contribution= ₹ 4,00,000	**Contribution= ₹ 5,04,000**

(ii) **Calculation of Margin of safety (MOS) in %**

MOS = $\frac{Contribution - Fixed\ Cost}{Contribution}$ - = $\frac{EBIT}{Contribution}$

N Limited	C Limited
MOS = 1,00,000/4,00,000 = 25%	MOS = 1,68,000/5,04,000 = 33.33%

Part (ii) can also be presented in following way:

Calculation of Margin of safety (MOS) in %

MOS = 1/operating leverage (OL)

OL = CL/FL

N Limited	C Limited

OL = 8/2 = 4	OL = 4.5/1.5 = 3
MOS = 1/4 = 25%	MOS = 1/3 = 33.33%

(iii) Sales of C Limited

Let assume that PV ratio is 40%

$$\text{PV Ratio} = \frac{Contribution}{Sales\ OR\ Sales} = \frac{Contribution}{PV\ Ratio}$$

$$\text{Sales} = \frac{5,04,000}{0.40} = ₹\ 12,60,000$$

Part (iii) of the solution can be solved by any alternative assumption.

Question 6 : (Jan 2025)

Following is the Balance Sheet of EXIM Ltd. as on 31st March, 2024:

Liablities	₹	Assets	₹
Equity Share Capital of ₹100 each	20,00,000	Fixed Assets	50,00,000
Retained Earnings	4,00,000	Current Assets	30,00,000
12.5 % Debenture	40,00,000		
Current Liabilities	16,00,000		
	80,00,000		**80,00,000**

The additional information is given as under:

Fixed costs per annum (exclusive interest) : ₹16,00,000

Variable operating cost ratio : 70%

Total Assets turnover ratio : 2.5

Income tax rate : 30%

You are required to calculate:

(i) Earnings per Share

(ii) Operating Leverage

(iii) Financial Leverage

(iv) Combined Leverage

Question 7 : (RTP Sept 2024)

Following data of PC Ltd. under Situations 1, 2 and 3 and Financial Plan A and B is given:

Installed Capacity (units)		3,600
Actual Production and Sales (units)		2,400
Selling price per unit (₹)		30
Variable cost per unit (₹)		20
Fixed Costs (₹):	Situation 1	3,000
	Situation 2	6,000
	Situation 3	9,000

Capital Structure:

Particulars	Financial Plan	
	A	B
Equity	₹ 15,000	₹ 22,500
Debt	₹ 15,000	₹ 7,500
Cost of Debt	12%	12%

Required:

(i) CALCULATE the operating leverage and financial leverage.

(ii) FIND out the combinations of operating and financial leverage which give the highest value and the least value.

Solution 7 :

(i) Operating Leverage

	Situation 1	Situation 2	Situation 3
	(₹)	(₹)	(₹)
Sales (S)			
2,400 units @ ₹ 30 per unit	72,000	72,000	72,000

Less: Variable Cost (VC) @ ₹ 20 per unit	48,000	48,000	48,000
Contribution (C)	24,000	24,000	24,000
Less: Fixed Cost (FC)	3,000	6,000	9,000
EBIT	21,000	18,000	15,000
Operating Leverage $=\frac{C}{EBIT}$	$\frac{₹24,000}{₹21,000}$= 1.14	$\frac{₹24,000}{₹18,000}$= 1.33	$\frac{₹24,000}{₹15,000}$= 1.60

Financial Leverage

	Financial Plan	
	A (₹)	**B (₹)**
Situation 1		
EBIT	21,000	21,000
Less: Interest on debt (₹ 15,000 x 12%); (₹ 7,500 x 12%)	1,800	900
EBT	19,200	20,100
Financial Leverage = $\frac{EBIT}{EBT}$	$\frac{₹21,000}{₹19,200}$= 1.09	$\frac{₹21,000}{₹20,100}$= 1.04
Situation 2		
EBIT	18,000	18,000
Less: Interest on debt	1,800	900
EBT	16,200	17,100
Financial Leverage = $\frac{EBIT}{EBT}$	$\frac{₹18,000}{₹16,200}$= 1.11	$\frac{₹18,000}{₹17,100}$= 1.05
Situation 3		
EBIT	15,000	15,000
Less: Interest on debt	1,800	900
EBT	13,200	14,100
Financial Leverage = $\frac{EBIT}{EBT}$	$\frac{₹15,000}{₹13,200}$= 1.14	$\frac{₹15,000}{₹14,100}$= 1.06

(ii) Combined Leverages

		Financial Plan	
		A (₹)	**B (₹)**
(a)	Situation 1	1.14 x 1.09 = 1.24	1.14 x 1.04 = 1.19
(b)	Situation 2	1.33 x 1.11 = 1.48	1.33 x 1.05 = 1.40
(c)	Situation 3	1.60 x 1.14 = 1.82	1.60 x 1.06 = 1.70

CL = OL x FLThe above calculations suggest that the highest value is in Situation 3 financed by Financial Plan A and the lowest value is in the Situation 1 financed by Financial Plan B.

Financial Analysis & Planning - Ratio Analysis

I. PROFITABILITY RATIOS BASED ON SALES:

i. **Gross Profit Ratio=** $\frac{Gross\ Profit}{Net\ Sales}$ (In %)

ii. **Operating Profit Ratio=** $\frac{Operating\ Profit}{Net\ Sales}$ (In %)

Net Profit as per P & L Account
(+) Non-Operating Expenses (e.g. Loss on sale of assets, preliminary Expenses written off, etc.)
(-) Non-Operating Income (e.g. Rent, Interest & Dividends received)

Significance = Indicator of Operating Performance of business.

iii. **Net Profit Ratio=** $\frac{Net\ Profit}{Net\ Sales}$ (In %)

Net Profit = Net profit as per P & L A/c (either before tax or after tax, depending upon data).

iv. **Contribution Sales Ratio [or] Profit Volume Ratio=** Contribution/ Sales

Contribution = Sales Less Variable Costs.

II. COVERAGE RATIOS:

i. **Debt Service Coverage Ratio=** $\frac{Earnings\ for\ Debt\ Service}{(Interest + Instalment)}$ (In Times)

Earnings for Debt Service = Net Profit after Taxation
(+) Interest on Debt Funds
(+) Non-Cash Operating Expenses(e.g. depreciation & amortizations)
(+) Non-Operating Items/Adjustments (e.g. Loss on sale of Fixed Assets,etc.)

Interest + Instalment = Interest + Principal (Instalment of Loan Principal)

ii. **Interest Coverage Ratio=** $\frac{EBIT}{Interest}$ (In Times)

iii. **Preference Dividend Coverage Ratio=** $\frac{EAT}{Preference\ Dividend}$ (In Times)

III. TURNOVER/ACTIVITY/PERFORMANCE RATIOS

i. **Raw Material Turnover Ratio=** $\frac{Cost\ of\ Raw\ Material\ Consumed}{Average\ Stock\ of\ Raw\ Material}$ (In Times)

Cost of Raw Material Consumed = Opening Stock of Raw Materials
(+) Purchases of Raw Materials
(-) Closing Stock of Raw Materials

Average Stock of Raw Material= $\frac{(Opening\ RM\ Stock + Closing\ RM\ Stock)}{2}$

ii. **WIP Turnover Ratio=** $\frac{Factory\ cost}{Average\ Stock\ of\ WIP}$ (In Times)

iii. **Finished Goods or Stock Turnover Ratio=** $\frac{Cost\ of\ Goods\ Sold}{Average\ Stock\ of\ Finished\ Goods}$ (In Times)

Cost of Goods Sold = (a) For Manufacturers: OpeningStock of FG (+)Cost of Production (-) Closing Stock of FG.

(b) For Traders: Opening Stock of FG + Cost of Goods Purchased (-) Closing Stock of FG.

Average Stock of Finished Goods = $\frac{(Opening\ FG\ Stock + Closing\ FG\ Stock)}{2}$

iv. Debtors Turnover Ratio= $\frac{Credit\ Sales}{Average\ Account\ Receivable}$ (In Times)

Average Accounts Receivable = Average Accounts Receivable (i.e. Debtors + B/R)

$\frac{(Opening\ Drs\ \&\ B/R + Closing\ Drs\ \&\ B/R)}{2}$

v. Creditors Turnover Ratio= $\frac{Credit\ Purchases}{Average\ Accounts\ Payable}$ (In Times)

Average Accounts Payable = Average Accounts Payable (i.e. Creditors + B/P)

$\frac{(Opening\ Crs\ \&\ B/P + Closing\ Crs\ \&\ B/P)}{2}$

vi. Working Capital Turnover Ratio= $\frac{Turnover\ (Net\ Sales)}{Net\ Working\ Capital}$ (In Times)

[Also called Operating Turnover (or) Cash Turnover Ratio]
Net Working Capital = Current Assets Less: Current Liabilities
(Average of Opening and Closing balances may be taken)

vii. Fixed Assets Turnover Ratio= $\frac{Turnover}{Net\ Fixed\ Assets}$ (In Times)

Net Fixed Assets = Net Fixed Assets **(Average of Opening and Closing balances may be taken)**

viii.Capital Turnover Ratio = $\frac{Turnover}{Capital\ Employed}$ (In Times)

Capital Employed = **(Average of Opening and Closing balances may be taken)**

ALSO STUDY CONCEPT OF DEBTOR, CREDITORS & STOCK VELOCITY

IV. CAPITAL STRUCTURE RATIOS

i. Debt to Total Assets Ratio = $\frac{Total\ Debt}{Total\ Assets}$

Debt = Borrowed Funds (or) Loan Funds
= Debentures + Long-Term Loans from Banks, Financial Institutions, etc.

ii. Debt Ratio = $\frac{Total\ Debt}{Net\ Assets}$

iii. Equity to Total Funds Ratio = $\frac{Equity}{Total\ Funds}$

iv. Equity Ratio = $\frac{Shareholders\ Equity}{Net\ Assets}$

v. Debt – Equity Ratio = $\frac{Total\ Debt}{Equity}$ OR $\frac{Long\ term\ Debt}{Equity}$

vi. Capital Gearing Ratio = $\frac{Preference\ Capital + Debentures + other\ borrowed\ funds}{Equity\ Shareholders\ Funds}$

vii. Proprietary Ratio = $\frac{Proprietary\ Funds}{Total\ Assets}$

Proprietary Funds = Net Worth (or) Shareholders' Funds (or) Proprietors' Funds (or) Owners' Funds (or) Own Funds
= Equity Share Capital + Preference Share Capital + Reserves & Surplus Less: Miscellaneous Expenditure (as per Balance Sheet) and Accumulated Losses.

viii. Fixed Asset to Long Term Fund Ratio = $\frac{Fixed\ Assets}{Long\ Term\ Funds}$

V. LIQUIDITY RATIO

These ratios show company's ability to meet its short term financial obligation like current ratio and quick ratio.

i. Current Ratio= $\frac{Current\ Assets}{Current\ Liabilities}$

ii. Quick Ratio= Quick Assets / Current Liabilities

iii. Absolute Cash Ratio [or] Cash Ratio [or] Absolute Liquidity Ratio = $\frac{Cash + Marketable\ Securities}{Current\ Liabilities}$

Cash + Marketable Securities = Cash in Hand
(+) Cash at Bank (Dr)
(+) Marketable Investments/Short Term Securities(current investments)

iv. Basic Defence Interval Measure= $\frac{Quick\ Assets}{Cash\ Expenses\ per\ day}$(In days)

Quick Assets = Current Assets
(-) Inventories
(-) Prepaid Expenses

Cash Expenses per Day = $\frac{Annual\ Cash\ Expenses}{365}$

Cash Operating Expenses = COGS + Selling admin other expenses (excluding depreciation and non cash exp)
Cash Expenses = Total Expenses (-) Depreciation& write-offs.
Significance= Ability to meet regular Cash Expenses.

VI. OVERALL RETURN RATIOS - OWNER VIEW POINT

i. Return on Investment (ROI) [or] Return on Capital Employed (ROCE) =

Pre-tax ROCE: = $\frac{EBIT}{Capital\ Employed}$

Post-tax ROCE: = $\frac{EBIT(1-t)}{Capital\ Employed}$ = $\frac{Eat + Interest}{Capital\ Employed}$

ii. Return on Net Worth (RONW) =

Pre-tax RONW: =

Post – tax RONW: =

Equity (or) Net Worth (or) Shareholders' Funds (or) Proprietors' Funds (or) Owners' Funds (or)Own Funds

iii. Return on Assets (ROA) =

Pre-tax ROA: = $\frac{EBT}{Average\ Total\ Assets}$

Post-tax ROA: = $\frac{EAT + Interest}{Average\ Total\ Assets}$ or $\frac{EBT(1-T)}{Average\ Total\ Assets}$

iv. Earnings per Share (EPS)= $\frac{Residual\ Earnings}{Number\ of\ Equity\ Shares}$

Number of Equity Shares outstanding = $\frac{Equity\ Capital}{Face\ Value\ per\ Share}$

v. Dividend per share(DPS)= $\frac{Total\ Equity\ Dividend}{Number\ of\ Equity\ Shares}$

vi. Price Earnings Ratio (PE Ratio)= $\frac{Market\ Price\ per\ Share}{Earnings\ per\ share}$

vii. Dividend Yield (%)= $\frac{Dividend}{Market\ price\ per\ share}$

viii. Book Value per Share= $\frac{ESHF}{Number\ of\ Equity\ Shares}$

Number of Equity Shares outstanding = $\frac{Equity\ Capital}{Face\ value\ per\ share}$

ix. Market Value to Book Value= $\frac{Market\ Price\ per\ Share}{Book\ Value\ per\ Share}$

X. Q Ratio = $\frac{Market\ Value\ of\ equity\ and\ liabilities}{Estimated\ replacement\ cost\ of\ assets}$ or $\frac{Market\ Value\ of\ Company}{Asset\ Replacement\ Cost}$

Du Pont Models

i. ROI = Net Operating Ratio × Capital Turnover Ratio

ii.Return on Equity = Net Profit Margin × Asset Turnover Ratio × Equity Multiplier

Net Profit Margin = Net Income ÷ Revenue
Asset Turnover Ratio = Revenue ÷ Assets
Equity Multiplier = Assets ÷ Shareholders' Equity

Important Notes

1. We prefer to use averages in denominator if it can be consistently applied, otherwise we have to use closing values to maintain consistency.
2. Compare Operating expenses/ operating cost / operating profit ratio

Question 8 : (MTP October 2023)

ABC Ltd. has total sales of 12,00,000 all of which are credit sales. It has a gross profit ratio of 20% on sales and a current ratio of 2. The company's current liabilities are ₹ 3,00,000. Further, it has inventories of ₹ 1,00,000, marketable securities of ₹ 70,000 and cash of ₹ 50,000. From the above information:

(i) CALCULATE the average inventory if the expected inventory turnover ratio is three times?

(ii) Also CALCULATE the average collection period if the opening balance of debtors is expected to be ₹ 1,20,000.

Assume 360 days a year.

Solution 8 :

(i) Calculation of Average Inventory

Since gross profit is 20% of sales, the cost of goods sold should be 80% of the sales.

Cost of goods sold = 12,00,000 x $\frac{80}{100}$ = 9,60,000

Inventory Turnover = $\frac{Cost\ of\ Goods\ sold}{Average\ inventory}$

3 = $\frac{9,60,000}{Average\ inventory}$

Average Inventory = $\frac{9,60,000}{3}$ = 3,20,000

(ii) Calculation of Average Collection Period

Average Collection Period = $\frac{Average\ Receivables}{Credit\ Sales}$ x 360

Where, Average Receivables = $\frac{Opening\ Receivables + Closing\ Receivables}{2}$

Calculation of Closing balance of Receivables

	₹	₹
Current Assets (2 x 3,00,000)		6,00,000
Less: Inventories	1,00,000	
Less: Marketable Securities	70,000	
Less: Cash	50,000	2,20,000
Receivables (Closing Balance)		**3,80,000**

Now, Average Receivables = $\frac{1,20,000+3,80,000}{2}$ = 2,50,000

So, Average Collection Period = $\frac{2,50,000}{12,00,000}$ x 360 = 75 days

Question 9 :(MTP March 2024)

ANVY Ltd. has furnished the following ratios and information for the year end 31st March, 2023:

Equity share capital	₹ 2,00,000
The relevant ratios of the company are as follows:	
Current debt to total debt	0.50
Total debt to Equity share capital	0.60
Fixed assets to Equity share capital	0.70
Total assets turnover	2.5 Times
Inventory turnover	10 Times

You are required to PREPARE the Balance Sheet of ANVY Ltd. as on 31st March, 2023.

Solution 9 :

ANVY Ltd

Balance Sheet as on 31st March, 2023

Liabilities	₹	Assets	₹
Equity share capital	2,00,000	Fixed assets	1,40,000
Current debt	60,000	Cash (balancing figure)	1,00,000
Long term debt	60,000	Inventory	80,000
	3,20,000		3,20,000

Working Notes

1. Total debt = 0.60 x Equity share capital = 0.60 x ₹ 2,00,000 = ₹ 1,20,000

Further, Current debt to total debt = 0.50.

So, current debt = 0.50 x ₹1,20,000 = ₹ 60,000,

Long term debt = ₹1,20,000 - ₹60,000= ₹ 60,000

2. Fixed assets = 0.70 × Equity share Capital = 0.70 × ₹ 2,00,000 = ₹ 1,40,000

3.Total assets to turnover = 2.5 Times: Inventory turnover = 10 Times Hence, Inventory /Total assets = 2.5/10=1/4, Total assets = ₹ 3,20,000 Therefore Inventory = ₹ 3,20,000/4 = ₹ 80,000

Question 10: (Nov 2023)

You are available with following information of Brave Ltd:

Debtor's velocity	3 months
Stock velocity	6 months
Creditor's velocity	2 months
Gross profit ratio	20%

The gross profit for the year ended 31st March,2023 was ₹ 10,00,000. Stock for the same period was ₹ 40,000 more than what it was at the beginning of the year. Bills receivable were ₹ 1,20,000.

Form the above information you are required to calculate:

(i) Sales

(ii) Sundry debtors

(iii) Closing stock

Solution 10 :

(i) Determination of Sales:

Gross Profit Ratio $= \frac{Gross\ Profit}{Sales} \times 100$

Or, $\frac{20}{100} = \frac{₹10,00,000}{Sales}$

Or, Sales $= \frac{10,00,00,000}{20} = ₹50,00,000$

Cost of Goods Sold = Sales – Gross Profit

= ₹ 50,00,000 - ₹ 10,00,000 = ₹ 40,00,000

(ii) Determination of Sundry Debtors:

Debtors' velocity is 3 months or Debtors' collection period is 3 months,

So, Debtors' turnover ratio $= \frac{12\ months}{3\ months} = 4$

Debtors' turnover ratio $= \frac{Credit\ Sales}{Average\ Accounts\ Receivable}$

$= \frac{₹50,00,000}{Bills\ Receivables + Sundry\ Debtors} = 4$

Or, Sundry Debtors + Bills receivable = ₹ 12,50,000

Sundry Debtors = ₹ 12,50,000 – ₹ 1,20,000 = ₹ 11,30,000

(iii) Determination of Closing Stock

Stock velocity is 6 months so Stock Turnover Ratio=2

Stock Turnover Ratio $= \frac{Cost\ of\ Goods\ Sold}{Average\ Stock} = \frac{₹40,00,000}{Average\ Stock} = 2$

So, Average Stock = ₹ 20,00,000

Now Average Stock $= \frac{Opening\ Stock + Closing\ Stock}{2}$

Or $\frac{Opening\ stock + (operating\ stock + ₹40,000)}{2} = ₹\ 20,00,000$

Or, Opening Stock + ₹ 20,000 = ₹ 20,00,000

Or, Opening Stock = ₹ 19,80,000

So, Closing Stock = ₹ 19,80,000 + ₹ 40,000 = ₹ 20,20,000

Question 11 : (May 2024)

Theme Ltd provides you the following information:

12.5% Debt	₹45,00,000
Debt to Equity Ratio	1.5 : 1
Return on shareholder's fund	54%
Operating Ratio	85%
Ratio of operating expenses to Cost of Goods sold	2 : 6
Tax Rate	25%
Fixed Assets	₹ 39,00,000
Current Ratio	1.8 : 1

You are required to calculate:

(i) Interest Coverage Ratio

(ii) Gross Profit Ratio

(iii) Current Assets

Solution 11 :

(a) Working Notes:

Debt = ₹ 45,00,000

Interest = ₹ 45,00,000 x 12.5%= 5,62,500

Debt to Equity = 1.5:1 = $\frac{Total\ Debt}{Shareholder's\ Equity}$

Equity = ₹ 30,00,000

Return of Shareholder's funds = 54% = $\frac{Net\ Profit\ after\ taxes}{Equity\ shareholder's\ fund}$ ×100

Profit after tax (PAT) = 54% x Equity = ₹16,20,000

Profit before tax (PBT)(1-25%) = Profit after tax

= ₹16,20,000/75% = ₹21,60,000

Earning before interest and tax (EBIT) = PBT + Interest

= ₹21,60,000 + ₹ 5,62,500

= ₹27,22,500

(i) Interest Coverage Ratio = EBIT/Interest

= ₹27,22,500/₹5,62,500

= 4.84 Times

(ii) Operating Profit Ratio = 1 - Operating Ratio

= 1 – 0.85 = 0.15 or 15%

0.15 = $\frac{Operating\ Profit}{Sales}$×100

Sales = EBIT or Operating Profit /0.15

= ₹ 27,22,500 / 0.15

= ₹ 1,81,50,000

Operating ratio = $\frac{Operating\ expenses}{Cost\ of\ goods\ sold\ (COGS)}$ = 2:6 = 1:3

Operating expenses = 1/3COGS

Operating cost = Sales – Operating profit

= ₹ 1,81,50,000 - ₹ 27,22,500

= ₹ 1,54,27,500

₹ 1,54,27,500 = COGS + Operating expenses

₹ 1,54,27,500 = COGS + 1/3COGS

COGS = ₹ 1,15,70,625

Gross profit = Sales – COGS

= 1,81,50,000 – 1,15,70,625

= ₹ 65,79,375

Gross Profit ratio = $\frac{Gross\ Profit}{Sales}$×100

= 65,79,375/1,81,50,000

= 0.3625 or 36.25%

Gross profit and sales can be calculated in alternative way also. However, there will be no change in GP ratio i.e 36.25%

(iii) Current Ratio = $\frac{Current\ Assets}{Current\ liabilities}$

= 1.8

Current Assets = 1.8 Current Liabilities

Total of Balance sheet liability = Equity + Debt + Current Liabilities

=30,00,000+45,00,000+CL..... (2)

Total Balance sheet asset = Fixed Assets + Current Assets

= 39 lakhs + CA= 39 + 1.8CL..... (3)

Equating 2 and 3,

75,00,000 + CL = 39,00,000 + 1.8CL

0.8CL = 36,00,000

CL =₹ 45,00,000

Current Assets = 1.8 CL = 1.8 x 45 lakhs= **₹ 81,00,000**

Question 12 : (Sept 2024)

Following information relates to MNP Limited for the year ended on 31sMarch, 2024:

Inventory turnover ratio (based on cost of goods sold)	7.5 times
Total assets turnover ratio	2.5 times

Long term debt to Shareholders' fund	0.6:1
Debtors collection period	30 days
Gross profit ratio	25% on sales
Current Ratio	2.9:1

Balance Sheet as on 31st March,2024

Liabilities	₹	Assets	₹
Equity share capital	6,00,000	Fixed Assets	?
Reserves & Surplus	3,00,000	Inventories	?
Long term debt	?	Debtors	?
Creditors	3,00,000	Cash	?
Total		**Total**	

You are required to complete the Balance Sheet of MNP Limited as on 31st March,2024. Assume a 360 days year and all sales are credit sales.

Solution 12 :

Working Notes:

Long term debt to Shareholder's fund = 0.6:1

Long term debt = 0.6 x ₹ 9,00,000 = ₹ 5,40,000

Total Assets = ₹ 17,40,000

Total Asset turnover ratio = $\frac{Sales}{Total\ Assets}$ = 2.5 times

Sales = 2.5 x ₹ 17,40,000 = ₹ 43,50,000

Current ratio = Current Assets Current Liabilities = 2.9:1

Current Assets = 2.9 x ₹ 3,00,000 = ₹ 8,70,000

Fixed Assets = Total Assets - Current Assets

= ₹ 17,40,000 – ₹ 8,70,000 = ₹ 8,70,000

Gross profit ratio = 25% on sales

Gross Profit (GP) = ₹ 43,50,000 x 0.25 = ₹ 10,87,500

Cost of Good Sold (COGS) = Sales – GP

= ₹ 43,50,000 - ₹ 10,87,500

= ₹ 32,62,500

Inventory Turnover Ratio = $\frac{Cost\ of\ Goods\ Sold}{Average\ Inventory}$ = 7.5 times

Inventory = ₹ 32,62,500/7.5 = ₹ 4,35,000

Debtor Collection Period = $\frac{Average\ Accounts\ Receivables}{Average\ Daily\ Credit\ Sales}$ = 30 days

Receivables = 30 days x ₹ 43,50,000/360 days = ₹ 3,62,500

Balance Sheet as on 31st March 2024

Liabilities	(₹)	Assets	(₹)
Share Capital	6,00,000	Fixed Assets	8,70,000
Reserve and Surplus	3,00,000	Inventories	4,35,000
Long-term loan	5,40,000	Debtors	3,62,500
Creditors	3,00,000	Cash (Balancing Figure)	72,500
	17,40,000		**17,40,000**

Question 13 : (Jan 2025)

The equity share capital of Sky pack Ltd. as on 31st march , 2024 was ₹2,00,000. The relevant ratios of the company are as follows:

Current debt to Total Debt	0.35
Total debt to Owner's equity	0.65
Fixed assets to Owner's equity	0.55
Total assets turnover	2.5 times
Inventory turnover	10 times

You are required to prepare the Balance Sheet of Sky Pack Ltd. as on 31st March, 2024.

Question 14 :(RTP Nov 2023)

From the following table of financial ratios of Prabhu Chemicals Limited, comment on various ratios given at the end:

Ratios	2021	2022	Average of Chemical Industry
Liquidity Ratios			
Current ratio	2.1	2.3	2.4
Quick ratio	1.4	1.8	1.4
Receivable turnover ratio	8	9	8
Inventory turnover	8	9	5
Receivables collection period	46 days	41 days	46 days
Operating profitability			
Operating income –ROI	24%	21%	18%
Operating profit margin	18%	18%	12%
Financing decisions			
Debt ratio	45%	44%	60%
Return			
Return on equity	26%	28%	18%

COMMENT on the following aspect of Prabhu Chemicals Limited

(i) Liquidity
(ii) Operating profits
(iii) Financing
(iv) Return to the shareholders

Solution 14 :

Ratios	Comment
Liquidity	Current ratio has improved from last year and matching the industry average. Quick ratio also improved than last year and above the industry average. The reduced inventory levels (evidenced by higher inventory turnover ratio) have led to better quick ratio in FY 2022 compared to FY 2021. Further the decrease in current liabilities is greater than the collective decrease in inventory and debtors as the current ratio have increase from FY2021 to FY 2022.
Operating Profits	Operating Income-ROI reduced from last year, but Operating Profit Margin has been maintained. This may happen due to decrease in operating cost. However, both the ratios are still higher than the industry average.
Financing	The company has reduced its debt capital by 1% and saved earnings for equity shareholders. It also signifies that dependency on debt compared to other industry players (60%) is low.
Return to the shareholders	Prabhu's ROE is 26 per cent in 2021 and 28 per cent in 2022 compared to an industry average of 18 per cent. The ROE is stable and improved over the last year.

Question 15 :(MTP AUG 2024)

EPL Ltd. has furnished the following information relating to the year ended 31st March 2023 and 31st March, 2024:

	31st March, 2023	31st March, 2024
Share Capital	50,00,000	50,00,000
Reserve and Surplus	20,00,000	25,00,000
Long term loan	30,00,000	30,00,000

- Net profit ratio: 8%
- Gross profit ratio: 20%
- Long-term loan has been used to finance 40% of the fixed assets.

- Stock turnover with respect to cost of goods sold is 4.
- Debtors represent 90 days sales.
- The company holds cash equivalent to 1½ months cost of goods sold.
- Ignore taxation and assume 360 days in a year.

You are required to PREPARE Balance Sheet as on 31st March 2024 in following format:

Liabilities	(₹)	Assets	(₹)
Share Capital	-	Fixed Assets	-
Reserve and Surplus	-	Sundry Debtors	-
Long-term loan	-	Closing Stock	-
Sundry Creditors	-	Cash in hand	-

Solution 15 :

Change in Reserve & Surplus = ₹ 25, 00,000 – ₹ 20,00,000 = ₹ 5,00,000

So, Net profit = ₹ 5, 00,000

(i) Net Profit Ratio = 8%

∴ Sales = ₹5,00,000

(ii) Cost of Goods sold

= Sales – Gross profit Margin

= ₹ 62, 50,000 – 20% of ₹ 62, 50,000

= ₹ 50, 00,000

(iii) Fixed Assets $=\frac{₹30,00,000}{40\%}$=₹75,00,000

(iv) Stock $= \frac{Cost\ of\ Goods\ Sold}{STR} = \frac{50,00,000}{4} = ₹12,50,000$

(v) Debtors $= \frac{62,50,000}{360} \times 90$ = ₹15, 62, 500

(vi) Cash Equivalent $= \frac{50,00,000}{12} \times 1.5$ = ₹ 6, 25, 000

Balance Sheet as on 31st March 2024

Liabilities	**(₹)**	**Assets**	**(₹)**
Share Capital	50,00,000	Fixed Assets	75,00,000
Reserve and Surplus	25,00,000	Sundry Debtors	15,62,500
Long-term loan	30,00,000	Closing Stock	12,50,000
Sundry Creditors (Balancing Figure)	4,37,500	Cash in hand	6,25,000
	1,09,37,500		1,09,37,500

Question 16 : (RTP May 2024)

From the following information and ratios, PREPARE the Balance Sheet as on 31st March 2023 and Income Statement for the year ended on that date for Limelite & Co.

Gross Profit	₹ 1,20,000
Shareholders' Funds	₹ 5,00,000
Gross Profit margin	40%
Net Profit Margin	10%
PBIT to PBT	2:1
Credit sales to Total sales	80%
Total Assets turnover	0.4 times
Inventory turnover (Use sales as turnover)	5 times
Average collection period (a 360 days year)	30 days
Current ratio	2
Operating expenses (excluding interest)	₹ 60,000
Long-term Debt to Equity	40%
Tax	Nil

Solution 16 :

Gross Profit = ₹ 1,20,000

Gross Profit Margin = 40%

Sales = $\frac{Gross\ Profit}{Gross\ Profit\ Margin}$ = = ₹ 1,20,000 / 0.40 = ₹ 3,00,000

Net profit (PBT) = 3,00,000 x 10% = ₹ 30,000

PBIT/PBT = 2
PBIT = 2 x 30,000
PBIT = 60,000
Interest = 60,000 – 30,000 = ₹ 30,000
Credit Sales to Total Sales = 80%
Credit Sales = ₹ 3,00,000×0.80 = ₹ 2,40,000
Total Assets Turnover = 0.4 times
Total Assets = $\frac{Sales}{Total\ Assets\ Turnover}$ = $\frac{₹\ 3,00,000}{0.4}$ = ₹ 7,50,000
Inventory turnover = 5 times
Inventory = $\frac{Sales}{Inventory\ Turnover}$ = $\frac{3,00,000}{5}$ = ₹ 60,000
Average Collection Period = 30 days
Debtors turnover = $\frac{360}{Average\ Collection\ Period}$ = 360/30 = 12
Debtors = $\frac{Credit\ Sales}{Debtors\ turnover}$ = $\frac{₹\ 2,40,000}{12}$ = = ₹ 20,000
Current ratio = 2
2 = $\frac{Debtors + Inventory + Cash\ (Current\ Assets)}{Creditors\ (Current\ Liabilities)}$
2 Creditors = (₹ 20,000 + ₹ 60,000 + Cash)
2 Creditors = ₹ 80,000 + Cash ..... (i)
Long-term Debt to Equity = 40%
Shareholders' Funds (Equity) = ₹ 5,00,000
Long-term Debt = ₹ 5,00,000 × 40% = ₹ 2,00,000

Creditors = Total Assets – (Shareholder's fund + Long term debt)
= ₹ 7,50,000 – (5,00,000 + 2,00,000) = ₹ 50,000
Cash = (₹ 50,000×2) – ₹ 80,000 = ₹ 20,000 [From equation (i)]

Income Statement

	(₹)
Sales	3,00,000
Less: Cost of Goods Sold	1,80,000
Gross Profit	1,20,000
Less: Operating Expenses	60,000
PBIT	60,000
Less: Interest	30,000
Net Profit	**30,000**

Balance Sheet

Liabilities	₹	Assets		₹
Equity share capital	5,00,000	Fixed asset (bal. fig.)		6,50,000
Long term debt	2,00,000	Current assets:		
Current liability	50,000	Stock	60,000	
		Receivables	20,000	
		Cash	20,000	1,00,000
	7,50,000			**7,50,000**

Cost of Capital

Concept 1 - Cost of Debt (Bonds/Debentures/Bank loans - LongTerm etc)

Method 1: Irredemable Debt (approximation method)
Method 2: Redeemable Debt (approximation method)
Method 3: Yield to Maturity Method (YTM)

Method 1 Irredemable Debt

- We don't have to repay Debt
- When Life of Debt is not specified in Question

$$\textbf{Kd} = \frac{I\,(1-t)}{Net\ Proceeds} \textbf{ or } \frac{I\,(1-t)}{Market\ Price\ (when\ issue\ price\ is\ not\ given)}$$

- Net Proceeds = $(Face\ value\ +\ Premium\ -\ Discount)\ or\ (Issue\ Price)$ - Expenses on issue (Flotation cost, Brokerage, Commission, Management exp etc)
- Current Market Price may be used in place of issue cost

Note: If we calculate kd for one Debenture or All Debentures, the answer will be the same. So, better to calculate for one Debenture.

Method 2 Redeemable Debt (approximation method)

$$\textbf{Kd} = \frac{I\,(1-t) + (\frac{RV-NP}{n})}{(\frac{RV+NP}{2})}$$

RV = Redemption value
NP = Net Proceeds = Issue Price - Floatation Cost
n = Number of years left for Maturity

Method 3 Yield to Maturity Method (YTM)

- Rate at which NPV = 0
- By using the formulae of interpolation

$$\textbf{YTM = Lower Rate + Lower Rate NPV x } \frac{Difference\ of\ Rate}{Difference\ of\ NPV}$$

Concept 2 - Cost of Preference shares (Kp)

Method I : Irredeemable Preference Share (Approximation Method)
Method 2: Redeemable Preference Share (Approximation Method)
Method 3: YTM

Method I : Irredeemable Preference Share (Approximation Method)

$$\textbf{Kp} = \frac{P_D}{NP\ or\ MP}$$

Method 2: Redeemable Preference Share (Approximation Method)

$$\textbf{Kp} = \frac{P_D + (\frac{RV-NP}{n})}{(\frac{RV+NP}{n})}$$

PD = Preference Dividend
NP = Net proceeds = Issue price - Flotation cost
RV = Redemption value
n = Life of preference shares

Method 3: YTM for Kp (same rules as YTM of Kd)

Concept 3 - Cost of Equity (ke)

Equity doesn't have a fixed rate, so Ke has multiple formulae-

1.Dividend Price Model (same as dividend yield)

$$Ke = \frac{Dividend\ per\ share}{Market\ price\ of\ share} = \frac{DPS}{MPS} = \frac{D_1}{P_o}$$

2. EPS model (earning price model) (earning yield)

$$Ke = \frac{Earning\ \ per\ share}{Market\ price\ of\ share} = \frac{EPS}{MPS}$$

3. Dividend Growth Model (Gordon)

$$Ke = \frac{D_1}{P_o} + g$$

D1 = Proposed dividend / will pay dividend/ future dividend
g = growth rate of share price / company/dividend/earning
Ke = Cost of Equity
Po = price of share at 0 period (Today)

Note:

- Paid Dividend (Fast Tense) = D_0
- Expected dividend (Future Tense) = D_1
- Pays dividend – Do

Note: We must use **Ex dividend price** (not cum dividend price)

Cum dividend price	₹238
- Dividend	₹30
Ex dividend price	**₹208**

(This price should be used as "Po")

4. Earning Growth Model

$$Ke = \frac{EPS_1}{P_0} + g \text{ or } \frac{EPS_o(1+g)}{P_0} + g$$

5. Capital asset Pricing model (CAPM)

$$Ke = R_f + \beta\ (ER_m - R_f)$$

➔ **Beta of whole market = 1**
➔ **Risk free rate examples-**

- Government Bonds
- Treasury Bond
- Risk Free Investments
- Sovereign Bond

6. Realised Yield Approach

$$Ke = \frac{DPS_1 + (MPS_1 - MPS_0)}{MPS_0} = \frac{DPS_1}{MPS_0} + \frac{(MPS_1 - MPS_0)}{MPS_0}$$

Concept 4 - How to calculate Growth rate (g)

when we have old value and new value

g = b x r
b = Retention Rate
r = Rate of Return
Dividend Payment Rate + Retention Rate = 100%

g = $(\frac{New\ Value}{Old\ Value})^{\frac{1}{n}}$ **- 1**

New note : How to solve fractional power $(x)^{\frac{1}{n}}$
Step 1: Type "x"
Step 2: Press "$\sqrt{\ }$" 12 Times
Step 3: Type "-1="
Step 4: ÷ n =
Step 5: +1 =
Step 6: "x x = " 12 times

Concept 5 - Cost of Retained Earning

I. Kre = Ke (1-tp) (1-β)
tp= Personal Tax
β – brokerage

II. When we have to calculate Kre for old shareholders Retained earnings and Ke separately for new shares

Kre = $\frac{D_1}{MPS}$ **+ g** **(New) Ke =** $\frac{D_1}{NP}$ **+ g**

III. Ke = Kre (If no other information given in question)

Concept 6 - Calculation of WACC (Weighted Average Cost of Capital) or Ko (Overall Cost of Capital)

Ko/WACC

Book Value Weights -
The weight are dependent on book values (from balance sheet)

Market Value Weights -
The weights are based on market value of securities not book value

(i) WACC by Book Value Weights

Source	Book Value	Weights (A)	Rate (B)	WACC (AxB)
Equity SC	a	a/Total	**Ke**	✔
R&S	b	b/Total	**Kre**	✔
PSC	c	c/Total	**Kp**	✔
Debt	d	d/Total	**Kd**	✔
	Total			**WACC or Ko**

(ii) WACC by MarketValue Weights

Source	Book Value	Weights (A)	Rate (B)	WACC (AxB)
Equity SC	a	a/Total	**Ke**	✔
(MV of E)				
R&S	b	b/Total	**Kre**	✔
PSC	x	x/Total	**Kp**	✔
Debt	y	y/Total	**Kd**	✔

	Total			WACC or Ko

Concept 7 - Drive NP of New Debentures

The company proposes to issue 11 years 15% Debentures but yield on similar maturity Debentures is 16%.
Floatation cost 2%
Floatation cost is calculated on face value

Concept 8 - Shortcut method of calculation WACC (ko)

Shortcut method

$$Ko\ (WACC) = Ke \times \frac{E}{E+P+D} + Kp \times \frac{P}{E+P+D} + Kd \times \frac{D}{E+P+D}$$

$$Ko = Ke \times We + Kp \times Wp + Kd \times Wd$$

If we don't have preference share in question

$$Ko = Ke \times We + Kd \times Wd$$

$$= Ke \times \frac{E}{E+D} + Kd \times \frac{D}{E+D}$$

Concept 9 - How to Calculate Equilibrium Price

Step 1: Calculate Ke by CAPM

$$Ke = R_f + \beta\ (ER_m - R_f)$$

Step 2: Use this **Ke** in any other formulae to find Po

Ex: Dividend Growth Model

$$Ke = \frac{D_1}{P_o} + g$$

(Derive Ke using this)

Concept 10 - Additional Marginal Cost of Capital Weighted Marginal Cost of Capital (WMCC)

WMCC

- The average cost of additional fund used (when we calculate weighted average cost only for new funds which are raised)

Concept 11 - Kd for Deep Discount Bond / Zero Coupon Bond

- They are issued at low value and redeemed at high face value
- They don't pay interest

Concept 12 - Convertible Debentures

At end we have to decide the higher of the following option

- Redemption value (usually face value of debentures)

or

- Conversion value when debentures converted to shares at end

Question 17 : (MTP March 2024)

Ram Ltd evaluates all its capital projects using a discounting rate of 16%. Its capital structure consists of equity share capital, retained earnings, bank term loan and debentures redeemable at par. Rate of interest on bank term loan is 1.4 times that of debenture. Remaining tenure of debenture and bank loan is 4 years and 6 years respectively. Book value of equity share capital, retained earnings and bank loan is ₹ 20,00,000, ₹ 30,00,000 and ₹ 20,00,000 respectively. Debentures which are having book value of ₹ 30,00,000 are currently trading at ₹ 98 per debenture. The ongoing PE multiple for the shares of the company stands at 4.

You are required to:

(i) CALCULATE the rate of interest on bank loan and

(ii) CALCULATE the rate of interest on debentures

Tax rate applicable is 30%.

Solution 17 :

Working Note:

Let the rate of Interest on debenture be x

Rate of Interest on loan = 1.4x

kd on debentures = $\frac{Int\,(1-t)+\frac{RV-NP}{n}}{\frac{RV+NP}{2}} = \frac{100\times(1-0.30)+\frac{100-98}{4}}{\frac{100+98}{2}} = \frac{70x+0.5}{99}$

Kd on bank loan = 1.4 x (1 – 0.30) = **0.98x**

Ke = $\frac{EPS}{MPS} = \frac{1}{MPS/EPS} = \frac{1}{PE} = \frac{1}{4}$ = 0.25 , Ke = **0.25**

Computation of WACC

Capital	Amount	Weights	Cost	Product
Equity	20,00,000	0.2	0.25	0.05
Reserves	30,00,000	0.3	0.25	0.075
Debentures	30,00,000	0.3	(70x+0.5)/99	(21x+0.15)/99
Bank Loan	20,00,000	0.2	0.98x	0.196x
	1,00,00,000	1		0.125+0.196x + $\frac{21x+0.15}{99}$

WACC = 16%

0.125+0.196x+ $\frac{21x+0.15}{99}$ = 0.16

12.375+19.404x+21x+0.15 = (0.16)(99)

40.404x = 15.84 – 12.525

40.404x = 3.315

x = $\frac{3.315}{40.404}$, x = 8.20%

(i) Rate of interest on Bank loan = 1.4x = (1.4)(8.20%) = 11.48%.

(ii) Rate of interest on debenture = x = 8.20%

Question 18 : (Nov 2023)

Z Ltd. wishes to raise additional fund of ₹ 25,00,000 for meeting its investment plan. It has ₹ 5,25,000 in the form of retained earnings available for investment purposes. Further details are as following:

Combination of debt and equity	2:3
Cost of debt	
Upto ₹ 2,50,000	8% (before tax)
Above ₹ 2,50,000 and to upto ₹ 5,00,000	10% (before tax)
Beyond ₹ 5,00,000	12% (after tax)
Earning of company	₹ 50,00,000
Retention Ratio	40%
Expected growth of dividend	15%
Market price per share	₹ 500
Number of outstanding equity shares	1,00,000
Tax Rate	30%

You are required to calculate:

i. Cost of debt

ii. Cost of retained earnings and cost of equity

iii. Weighted average cost of capital

Solution 18 :

Equity 60% of ₹ 25,00,000 = ₹ 15,00,000
Debt 40% of ₹ 25,00,000 = ₹ 10,00,000

The capital structure after raising additional finance:

		(₹)
Shareholders' funds		
Equity Capital	(₹ 15,00,000 –₹5,25,000)	9,75,000
Retained earnings		5,25,000
Debt (Interest at 8% p.a.)		2,50,000
(Interest at 10% p.a.)	(₹ 5,00,000 – ₹ 2,50,000)	2,50,000
(Interest at 12% p.a.)	(₹ 10,00,000 – ₹ 5,00,000)	5,00,000
Total Funds		25,00,000

(i) Determination of post-tax average cost of additional debt:

Kd = I (1 – t)
Where,
I = Interest Rate
t = tax-rate
On ₹ 2,50,000 = 8% (1 – 0.3) = 5.6% or 0.056
On ₹ 2,50,000 = 10% (1 – 0.3) = 7% or 0.07
On ₹ 5,00,000 = 12% or 0.12

Average Cost of Debt

$= \frac{(₹2,50,000\times0.056)+(₹2,50,000\times0.07)+(₹5,00,000\times0.12)}{₹10,00,000}\times100 = 9.15\%$

(ii) Determination of cost of retained earnings and cost of equity by applying Dividend growth model:

Ke or Kr = $\frac{D1}{Po} + g = \frac{Do(1+g)}{Po} + g$

Where,
D0 = Dividend paid = 60% of EPS = 60% × ₹ 50 = ₹ 30
g = Growth rate = 15%
P0 = Current market price per share = ₹ 500

So, **Ke or Kr** = $\frac{₹30(1+0.15)}{₹500}$ + 0.15 = 0.069 + 0.15 = 21.9%

(iii) Computation of overall weighted average after tax cost of additional finance:

Particulars	(₹)	Weights	Cost of funds	Weighted Cost (%)
Equity (including retained earnings)	15,00,000	0.60	21.9%	13.14
Debt	10,00,000	0.40	9.15%	3.66
WACC	25,00,000			**16.80**

Alternative Presentation

Particulars (1)	(₹) (2)	Cost of funds (3)	Product (2) x (3)
Equity (including retained earnings)	15,00,000	21.9%	3,28,500
Debt	10,00,000	9.15%	91,500
Total	25,00,000		4,20,000

WACC = (Product / Total book value) x 100 = (4,20,000 / 25,00,000) x 100 = **16.8%**

Alternative Solution for 18(ii) and 18(iii)

If we assume expected growth rate of Dividend as 5%.

(i) Determination of cost of retained earnings and cost of equity by applying Dividend growth model:

Ke or Kr = $\frac{D1}{Po} + g = \frac{Do(1+g)}{Po} + g$

Where,
D0 = Dividend paid = 60% of EPS = 60% × ₹ 50 = ₹ 30
g = Growth rate = 5%
P0 = Current market price per share = ₹ 500

So, **Ke or Kr** = $\frac{₹30(1+0.05)}{₹500}$ + 0.05 = 0.063 + 0.05 = 11.3%

(ii) Computation of overall weighted average after tax cost of additional finance:

Particulars	(₹)	Weights	Cost of funds	Weighted Cost (%)
Equity (including retained earnings)	15,00,000	0.60	11.3%	6.78
Debt	10,00,000	0.40	9.15%	3.66
WACC	25,00,000			**10.44**

Alternative Presentation

Particulars (1)	(₹) (2)	Cost of funds (3)	(2) x (3)
Equity (including retained earnings)	15,00,000	11.3%	1,69,500
Debt	10,00,000	9.15%	91,500
Total	25,00,000		2,61,000

WACC = (Product / Total book value) x 100 = (2,61,000 / 25,00,000) x 100 = **10.44%**

Question 19 : (May 2024)

The capital structure of Shine Ltd. as on 31.03.2024 is as under:

Particulars	Amount (₹)
Equity share capital of ₹10 each	45,00,000
15% Preference share capital of ₹100 each	36,00,000
Retained earnings	32,00,000
13% convertible debenture of ₹100 each	67,00,000
11% Term Loan	20,00,000
Total	**2,00,00,000**

Additional information:

(A) Company issued 13% Convertible Debentures of ₹100 each on 01.04.2023 with a maturity period of 6 years. At maturity , the debenture holders will have an option to convert the debentures into equity shares of the company in the ratio of 1:4 (4 shares for each debenture). The market price of the equity share is ₹25 each as on 31.03.2024 and the growth rate of the share is 6% per annum.

(B) Preference stock, redeemable after eight years, is currently selling at ₹150 per share.

(C) The prevailing default-risk free interest rate on 10-year GOI treasury bonds is 6%. The average market risk premium is 8% and the Beta (β) of the company is 1.54.

Corporate tax rate is 25% and rate of personal income tax is 20%.

You are required to calculate the cost of:

(i) Equity Share Capital

(ii) Preference Share Capital

(iii) Convertible Debenture

(iv) Retained Earnings

(v) Term Loan

Solution 19 :

(i) Cost of Equity Share capital

As per CAPM Model Ke = Rf + ß (Rm − Rf)

Rf = 6%

B = 1.54

Rm-Rf = 8%

Ke = 6% + 1.54(8%)

Ke = **18.32%**

(ii) Cost of Preference Share capital

n = 8

Net Proceeds (NP) = 150

Redemption Value (RV) = 100

Preference Dividend (PD) = 15

$$Kp = \frac{PD + \frac{(RV - NP)}{n}}{\frac{(RV + NP)}{2}}$$

$$Kp = \frac{15 + \frac{(150 - 100)}{8}}{\frac{(150 + 100)}{2}}$$

Kp = **7%**

Alternatively, if we take NP as 100 and RV as 100, then solution can be done in the following way:

Cost of Preference Share capital

n	8
Net Proceeds (NP)	100
Redemption Value (RV)	150
Preference Dividend (PD)	15

$$Kp = \frac{PD+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}}$$

$$Kp = \frac{15+\frac{(150-100)}{8}}{\frac{(150+100)}{2}}$$

Kp = **17%**

(iii) Cost of convertible debenture

Cash Redemption Value (RV) = 100

Share Redemption Value (RV):

Value of share after 5 years = $25 \times (1.06)^5 = 33.46$

Share Redemption Value (RV) = 33.46 X 4=133.82

Therefore, investor will choose share redemption.

Redemption Value (RV) = 133.82

Net Proceeds (NP) = 100

n = 5

Interest (I) = 13

Tax (t) = 25%

$$Kd = \frac{I(1-t)+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}} = \frac{13(1-0.25)+\frac{(133.82-100)}{5}}{\frac{(133.82+100)}{2}}$$

Kd = **14.13%**

(iv) Cost of Retained Earnings

Kr = Ke (1-tp)= 18.32 % x (1-0.20) = **14.66%**

We can also take cost of equity as cost of retained earnings,

Accordingly, Kr = Ke = **18.32%**

(v) Cost of Term Loan = 11% x (1-0.25) = **8.25%**

Question 20 : (Sept 2024)

(a)Capital structure of T Limited as on 1st April,2024 is as under:

	₹
Equity Share Capital (₹ 10 per share)	50,00,000
10% Debentures (₹ 100 per Debenture)	40,00,000
12% Preference Share Capital (10,000 shares of ₹ 100 each)	10,00,000

Additional Information:

(1) The risk free rate of return is 10%. The Beta of T Ltd. is 1.75 and the return on market portfolio is 12%. The Equity shares have a current market price of ₹ 70 per share.

(2) The debentures are trading at a market price of ₹ 80 per debenture. The Debentures are to be redeemed after 5 years at par.

(3) Preference shares are redeemable after 5 years at a premium of 5%, presently selling at ₹ 104 per share.

(4) The Company pays tax at a rate of 30%.

(5) The Cost of Debentures are to be calculated on Yield to Maturity approach.

(6) The present value factors at 10% and 14% are:

Year	1	2	3	4	5
PVIF0.10,t	0.909	0.826	0.751	0.683	0.621
PVIF0.14,t	0.877	0.769	0.675	0.592	0.519

You are required to calculate Weighted Average Cost of Capital (after tax) of T Limited using Market value weights.

Solution 20 :

Cost of Equity Share Capital using Capital Asset Pricing Model (CAPM) Approach

Ke = Rf + ß (Rm – Rf)
Ke = 0.10 + 1.75 (0.12 – 0.10)
= 0.10 + 1.75 (0.02) = 0.135 or 13.5%

Cost of Redeemable Debentures using Yield to Maturity (YTM) Approach

Step-1: Identification of relevant cash flows

Year	Cash flows
0	Current market price (P0) = ₹ 80
1 to 5	Interest net of tax [I(1-t)] = 10% of ₹ 100 (1-0.30) = ₹ 7
5	Redemption value (RV) = Face value i.e. ₹ 100

Step- 2: Calculation of NPVs at two discount rates

Year	Cash flows (₹)	Discount factor @ 10% (L)	Present Value (₹)	Discount factor @ 14% (H)	Present Value (₹)
0	80	1.000	(80.000)	1.000	(80.000)
1 to 5	7	3.790	26.530	3.432	24.024
5	100	0.621	62.100	0.519	51.900
NPV			+8.630		-4.076

Step- 3: Calculation of Cost of Debentures (Kd)

Kd = $L+\frac{NPVL}{NPVL-NPVH}$ (H-L) = 10%+ $\frac{₹\,8.630}{₹\,8.630-(₹-4.076)}$ (14%-10%)= **12.72%**

Cost of Redeemable Preference Share Capital using approximation method

$$K_p = \frac{PD+\frac{(RV-NP)}{n}}{\frac{(RV+NP)}{2}} = \frac{12+\frac{(105-104)}{5}}{\frac{(105+104)}{2}} = 11.67\%$$

Calculation of WACC using market value weights

Source of Capital	Market Value	Weights	After tax cost of capital	WACC (Ko)
	(₹)	(a)	(b)	(c) = (a)×(b)
Equity Share Capital (₹ 70 x 5,00,000 equity shares)	3,50,00,000	0.8919	0.1350	0.1204
10% Debentures (₹ 80 × 40,000)	32,00,000	0.0816	0.1272	0.0104
12% Preference Share Capital (₹ 104 × 10,000 shares)	10,40,000	0.0265	0.1167	0.0031
	3,92,40,000	**1.000**		**0.1339**

WACC (Ko) = 0.1339 or 13.39%

Question 21 : (Jan 2025)

The following information pertain to CMC Limited:

Number of Equity Shares	20,00,000
Book Value of 10% Convertible Debentures	₹1,00,00,000
Book Value of 12% Bank Term Loan	₹25,00,000
Market Price of Equity Share	₹55
Market Value of 10% Convertible debenture	₹108
Face Value of Equity Share	₹10
Face Value of 10% Convertible Debenture	₹100
Beta coefficient of Equity shares of CMC Ltd.	1.5
Risk free rate of return	4.5%
Equity risk premium	9%
Rate of taxation	30%

The company expects that the share prices will rise in future at an average rate of 6% per annum. The 10% convertible debentures of ₹100 each will be converted in six years time into equity shares of the company in the ratio of 1:4 (4 equity shares for each debenture).
The market value of a 12% bank term loan is at par.
You are required to calculate:
(i) Cost of Equity Share Capital by applying Capital Asset Pricing Model (CAPM) Approach

(ii) Cost of Convertible Debenture by using approximation method,
(iii) Cost of Bank Term Loan
(iv) Weighted Average Cost of Capital using Market Value weights

Question 22 : (RTP Sept 2024)

BS Ltd. has the following capital structure at book-value as on 31st March, 2024:

Particulars	(₹)
Equity share capital (10,00,000 shares)	3,00,00,000
11.5% Preference shares	60,00,000
10% Debentures	1,00,00,000
	4,60,00,000

The equity shares of the company are sold for ₹ 300. It is expected that the company will pay next year a dividend of ₹ 15 per equity share, which is expected to grow by 5% p.a. forever. Assume a 35% corporate tax rate.

Required:

(i) COMPUTE weighted average cost of capital (WACC) of the company based on the existing capital structure.

(ii) COMPUTE the new WACC, if the company raises an additional ₹ 50 lakhs debt by issuing 10 years 12% debentures but the yield on debentures of similar maturity and risk class is 13%; flotation cost is 2%. Face value of the debenture is ₹100. This would result in increasing the expected equity dividend to ₹ 20 and leave the growth rate unchanged, but the price of equity share will fall to ₹ 250 per share.

Solution 22 :

(i) Computation of Weighted Average Cost of Capital based on existing capital structure

Source of Capital	Existing Capital structure (₹)	Weights (a)	After tax cost of capital (%) (b)	WACC (%) (a) × (b)
Equity share capital (W.N.1)	3,00,00,000	0.652	10.00	6.52
11.5% Preference share capital	60,00,000	0.130	11.50	1.50
10% Debentures (W.N.2)	1,00,00,000	0.218	6.50	1.42
Total	4,60,00,000	1.000		9.44

Working Notes:

1. Cost of Equity Capital:

$$Ke = \frac{Expected\ Dividend\ (D1)}{Current\ Market\ Price\ (Po)} + Growth(g)$$

$$= \frac{₹15}{₹300} + 0.05$$

= 10%

2. Cost of 10% Debentures

$$Kd = \frac{Interest(1-t)}{Net\ Proceeds}$$

$$= \frac{₹10,00,000(1-0.35)}{₹1,00,00,000}$$

= 0.065 or 6.5%

(ii) Computation of Weighted Average Cost of Capital based on new capital structure

Source of Capital	New Capital structure (₹)	Weights (a)	After tax cost of capital (%)(b)	WACC(%) (a) x (b)
Equity share capital (W.N.3)	3,00,00,000	0.588	13.00	7.64
11.5% Preference share capital	60,00,000	0.118	11.50	1.36
10% Debentures (W.N.2)	1,00,00,000	0.196	6.50	1.27
12% Debentures (W.N.4)	50,00,000	0.098	9.21	0.90
Total	5,10,00,000	1.000		11.17

Working Notes:

3. Cost of Equity Capital:

$K_e = \frac{₹20}{₹250} + 0.05$

= 13%

4. Cost of 12% Debentures

$Kd = \frac{I(1-t)+\left(\frac{RV-NP}{n}\right)}{\frac{RV+NP}{2}}$

$= \frac{₹12(1-0.35)+\left(\frac{₹100-₹90.31^*}{10\ years}\right)}{\frac{₹100+₹90.31^*}{2}}$

$= \frac{₹8.769}{₹95.155} = 0.0921$

*Since yield on similar type of debentures is 13 per cent, the company would be required to offer debentures at discount.

Market price of debentures (approximation method)

= ₹ 12 ÷ 0.13 = ₹ 92.31

Sale proceeds from debentures = ₹ 92.31 – ₹ 2 (i.e., floatation cost) = ₹ 90.31

Question 23 :(RTP May 2024)

Totto Ltd. has following capital structure as on 31st December 2023, which is considered to be optimum:

	(₹)
12% Debenture	4,50,000
10% Preference share capital	1,50,000
Equity shares capital (2,00,000 shares)	24,00,000

The company's share has a current market price of ₹ 30.25 per share. The expected dividend per share in next year is 50 percent of the 2023 EPS. The EPS of last 10 years is as follows. The past trends are expected to continue:

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
EPS (₹)	1.180	1.311	1.456	1.616	1.794	1.99	2.209	2.452	2.723	3.023

The company can issue 14 percent new debenture and 12 percent new preference share. The company's debenture is currently selling at ₹ 99.

The new preference issue can be sold at a net price of ₹ 9.90, paying a dividend of ₹ 1.25 per share. The company's marginal tax rate is 50%.

(i) CALCULATE the after-tax cost (a) of new debts and new preference share capital, (b) of ordinary equity, assuming new equity comes from retained earnings.

(ii) CALCULATE the marginal cost of capital for the new funds raised.

(iii) How much can be spent for capital investment before new ordinary share must be sold? Marginal cost of capital remains to be constant. (Assuming that retained earnings available for next year's investment is 50% of 2023 earnings.)

(iv) What will be the marginal cost of capital (cost of fund raised in excess of the amount calculated in part (iii) if the company can sell new ordinary shares of ₹ 22 per share? Assuming both the cost of debt and of preference share capital to be constant.

Solution 23 :

(i) Calculation of after-tax cost of the followings:

(a) New 14% Debentures (K_d) $= \frac{I(1-t)}{NP} = \frac{₹\ 14(1-0.5)}{₹\ 99}$ = 0.0707 or 7.07%

New 12% Preference Shares (K_p) $= \frac{PD}{NP} = \frac{₹\ 1.25}{₹\ 9.90}$ = 0.1263 or 12.63%

Where,

I = Interest

t = Tax rate

PD = Preference dividend

NP = Net proceeds

(b) Equity Shares (Retained Earnings) (K_e)

$= \frac{Expected dividend(D1)}{Current\ Market\ Price(P0)}$ + Growth Rate(G) $= \frac{50\% of ₹\ 3.023}{₹\ 30.25}$ = +0.11* = 0.16 or 16%

* Growth rate (on the basis of EPS) is calculated as below :

$\frac{EPS in current\ year - EPS in previous\ year}{EPS on\ previous\ year} = \frac{₹\ 3.023 - ₹\ 2.723}{₹\ 2.723} = 0.11$

(Students may verify the growth trend by applying the above formula to last three or four years. Growth Rate is rounded off)

(ii) Calculation of marginal cost of capital (on the basis of existing capital structure):

Source of capital	Weight (a)	After tax Cost of capital (%) (b)	WACC (%) (a) × (b)
14% Debenture	0.15	7.07	1.0605
12% Preference shares	0.05	12.63	0.6315
Equity shares	0.80	16.00	12.800
Marginal cost of capital			**14.492**

(iii) The company can spend for capital investment before issuing new equity shares and without increasing its marginal cost of capital:
Retained earnings can be available for capital investment
= 50% of 2023 EPS × equity shares outstanding
= 50% of ₹ 3.023 × 2,00,000 shares = ₹3,02,300

Since, marginal cost of capital is to be maintained at the current level i.e. 14.492%, the retained earnings should be equal to 80% of total additional capital for investment.
Thus, investment before issuing equity = $\left(\frac{₹\ 3,02,300}{80} \times 100\right)$ = ₹ 3,77,875
The remaining capital of ₹ 75,575 i.e. ₹ 3,77,875– ₹ 3,02,300 shall be financed by issuing 14% Debenture and 12% preference shares in the ratio of 3 : 1 respectively.

(iv) If the company spends more than ₹ 3,77,875 as calculated in part (iii) above, it will have to issue new shares at ₹ 22 per share.
The cost of new issue of equity shares will be:
$K_e = \frac{Expected dividend (D1)}{Current\ Market\ Price (P0)}$ +Growth Rate(g) = $\frac{50\%\ of\ ₹\ 3.023}{₹\ 22}$ +0.11 = 0.1787 or 17.87%

Calculation of marginal cost of capital (assuming the existing capital structure will be maintained):

Source of capital	Weight (a)	Cost (%) (b)	WACC (%) (a) × (b)
14% Debenture	0.15	7.07	1.0605
12% Preference shares	0.05	12.63	0.6315
Equity shares	0.80	17.87	14.296
Marginal cost of capital			**15.988**

Question 24 : (RTP Nov 2023)

Jason Limited is planning to raise additional finance of ₹ 20 lakhs for meeting its new project plans. It has ₹ 4,20,000 in the form of retained earnings available for investment purposes. Further details are as following:

Debt / Equity Mix	30 / 70
Cost of Debt	
Upto ₹ 3,60,000	8 % (before tax)
Beyond ₹ 3,60,000	12 % (before tax)
Earnings per share	₹ 4
Dividend pay-out	50% of earnings
Current Market Price per share	₹ 44
Expected Growth rate in Dividend	10 %
Tax	40%

You are required:
(a) To determine the cost of retained earnings and cost of equity.
(b) To determine the post-tax average cost of additional debt.
(c) To determine the pattern for raising the additional finance, and
(d) Compute the overall weighted average after tax cost of additional finance.

Solution 24 :

(a) Cost of Equity / Retained Earnings (using dividend growth model)

Ke = $\frac{D1}{Po}$
where D1 = Do (1 + g) = 2 (1 + .10) = 2.2
Ke = $\frac{2.2}{44}$ + 0.10 = 0.15 or 15 %

(b) Cost of Debt (Post Tax)

Kd = I (1-t)
Upto 3,60,000 Kd = .08 (1-0.4) = 0.048
Beyond 3,60,000 = .12 (1-0.4) = 0.072
Thus, post-tax cost of additional debt = 0.048 x 3,60,000 / 6,00,000 + 0.072 x 2,40,000/ 6,00,000 = 0.0288 + 0.0288 = 0.0576 or 5.76%

(c) Pattern for Raising Additional Finance

Debt = 20,00,000 x 30% = 6,00,000
Equity = 20,00,000 x 70 % = 14,00,000
Out of this total equity amount of ₹ 14,00,000 - Equity Shares
= 14,00,000 – 4,20,000
= 9,80,000
And Retained Earnings = 4,20,000

(d) Overall Weighted Average after tax cost of additional finance

WACC = Kd x Debt Mix + Ke x Equity Mix = 0.0576 x 30% + 0.15 x 70% = 0.01728 + 0.105 = 0.1223 or 12.23% (approx.)

Question 25 : (MTP Sept 2023)

ABC Company's equity share is quoted in the market at ₹ 30 per share currently. The company pays a dividend of ₹ 3 per share and the investor's market expects a growth rate of 7% per year.
You are required to:
(i) CALCULATE the company's cost of equity capital.
(ii) If the company issues 10% debentures of face value of ₹ 100 each and realises ₹ 95 per debenture while the debentures are redeemable after 10 years at a premium of 10%, CALCULATE cost of debenture using YTM?
Assume Tax Rate to be 50%.

Solution 25 :

(i) Cost of Equity Capital (Ke):

Ke=$\frac{Expected\ dividend\ per\ share\ (D1)}{Market\ price\ per\ share\ (Po)}$ + $Growth\ rate\ (g)$ = $\frac{₹3\times1.07}{₹30}$ + 0.07= 0.177 or 17.7%

(ii) Cost of Debenture (Kd):

Using Present Value method (YTM)

Identification of relevant cash flows

Year	Cash flows
0	Current market price (P0) = ₹ 95
1 to 10	Interest net of tax [I(1-t)] = 10% of ₹ 100 (1 – 0.5) = ₹ 5
10	Redemption value (RV) = ₹ 100 (1.10) = ₹ 110

Calculation of Net Present Values (NPV) at two discount rates

Year	Cash flows (₹)	Discount factor @ 5% (L)	Present Value (₹)	Discount factor @ 10% (H)	Present Value (₹)
0	(95)	1.000	(95.00)	1.000	(95.00)
1 to 10	5	7.722	38.61	6.145	30.725
10	110	0.614	67.54	0.386	42.46
NPV			+11.15		-21.815

Calculation of IRR

IRR=L+$\frac{NPV_L}{NPV_L - NPV_H}$(H-L)

= 5% + $\frac{₹11.15}{₹11.15-(₹-21.815)}$(10%-5%)= 5%+$\frac{₹55.75}{₹32.965}$=6.69%

Therefore, $K_d = 6.69\%$

Question 26 : (MTP October 2023)

Q Ltd. has the following capital structure at book-value as on 31st March 2022:

Particulars	**(₹)**
Equity share capital (10,00,000 shares)	4,00,00,000
12% Preference shares	80,00,000
11% Debentures	2,00,00,000
	6,80,00,000

The equity shares of the company are sold for ₹ 400. It is expected that the company will pay next year a dividend of ₹ 20 per equity share, which is expected to grow by 5% p.a. forever. Assume a 30% corporate tax rate. Required:

(i) COMPUTE weighted average cost of capital (WACC) of the company based on the existing capital structure.

(ii) COMPUTE the new WACC, if the company raises an additional ₹ 50 lakhs debt by issuing 12% debentures. This would result in increasing the expected equity dividend to ₹ 25 and leave the growth rate unchanged, but the price of equity share will fall to ₹ 300 per share. [10 Marks]

Solution 26 :

(i) Computation of Weighted Average Cost of Capital based on existing capital structure

Source of Capital	**Existing Capital structure (₹)**	**Weights (a)**	**After tax cost of capital (%) (b)**	**WACC (%) (a) × (b)**
Equity share capital (W.N.1)	4,00,00,000	0.588	10.00	5.88
12% Preference share capital	80,00,000	0.118	12.00	1.42
11% Debentures (W.N.2)	2,00,00,000	0.294	7.70	2.26
Total	6,80,00,000	1.000		9.56

Working Notes:

1. Cost of Equity Capital:

$$Ke = \frac{Expected\ dividend\ (D1)}{Current\ Market\ Price\ (Po)} + Growth\ (g)$$

$$= \frac{20}{400} + 0.05$$

= 10%

2. Cost of 10% Debentures

$$Kd = \frac{Interest(1-t)}{Net\ proceeds}$$

$$= \frac{22,00,000(1-0.30)}{2,00,00,000}$$

= 0.077 or 7.7%

(ii) Computation of Weighted Average Cost of Capital based on new capital structure

Source of Capital	**New Capital structure (₹)**	**Weights (a)**	**After tax cost of capital (%) (b)**	**WACC (%) (a) x (b)**
Equity share capital (W.N.3)	4,00,00,000	0.548	13.33	7.30
12% Preference share capital	80,00,000	0.110	12.00	1.32
11% Debentures (W.N.2)	2,00,00,000	0.274	7.70	2.11
12% Debentures (W.N.4)	50,00,000	0.068	8.40	0.57
Total	7,30,00,000	1.000		11.30

Working Notes:

3. Cost of Equity Capital:

$$Ke = \frac{25}{300} + 0.05 = 13.33\%$$

4. Cost of 12% Debentures

$$Kd = \frac{6,00,000(1-0.30)}{50,00,000}$$

= 0.084 or 8.4%

Capital Structure

Capital Structure:
When Company decides the ratio in which it will raise finance from different sources.

Concept 1 : Decide Capital Structure

Find our **EPS/MPS** and select the **highest EPS/MPS** option.

Particulars	Option I 100% Equity	Option II 50% Equity, 50% Debt	Option III 50% Equity , 50% PSC
EBIT			
- Interest Old			
New			
EBT			
- Tax			
EAT			
- Pref Div Old			
New			
EAES			
÷ No. of Equity Shares	÷n1	÷n2	÷n3
EPS	*	*	*
× P/E Ratio	×	×	×
MPS	*	*	*

Note 1

P/E Ratio = Price Earning Ratio = $\frac{MPS}{EPS}$

P/E Ratio×EPS =MPS

Concept 2: How to calculate EBIT at new level

Step 1: Calculate total existing capital.
Step 2: Calculate ROI at existing capital

ROI = $\frac{EBIT}{Capital\ Employed} \times 100$ **(Before Tax)**

Step 3: New Total Capital Employed = Old Capital Employed + New (Additional) Capital Employed
Step 4: New EBIT = New Total Capital Employed × ROI

Concept 3: Indifference Point

Level of EBIT at which EPS of two options will be same (equal)

EPS1 = EPS2

$$\frac{(EBIT - Int\ 1)(1-t) - Pref\ Div1}{n1} = \frac{(EBIT - Int2)(1-t) - PD2}{n2}$$

Cross multiply and solve for **EBIT.**

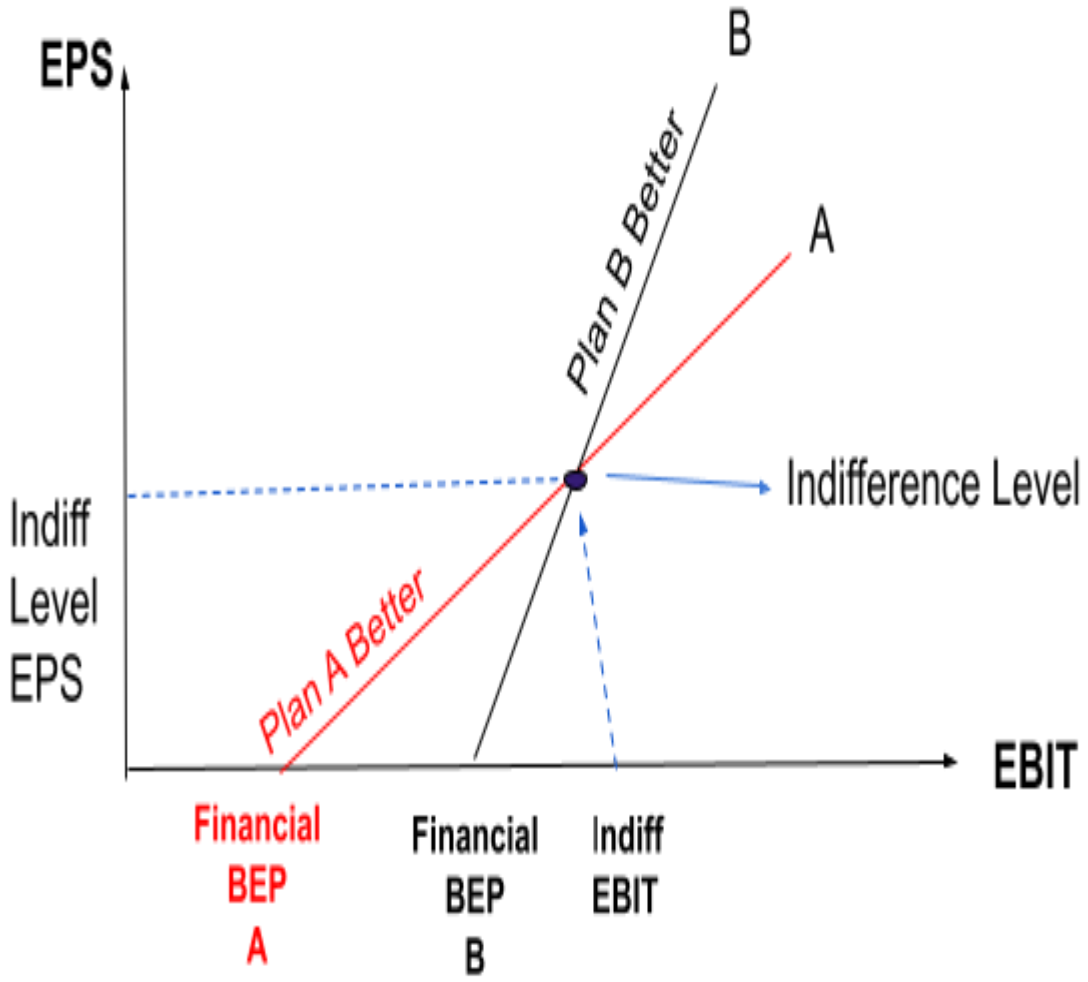
Note 1: Indifference point is always calculated for two plans.
Note 2: If we have three plans.
We will have to find 3 Indifference points, **one for each pair.**

Concept 4: Financial BEP.

Level up EBIT at which EPS = 0

= Interest + $\frac{Pref\ Div}{(1-t)}$

Concept 5: Diagram for Indifference Point × Financial BEP



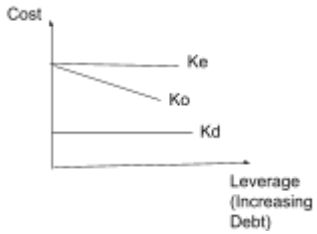
- Financial BEP is plotted on X axis, because it has EPS = 0.
- Before Indifference Point : Plan A is better.
- After Indifference Point : Plan B is better.

Note : You can solve by diagram or by taking two calculations

- One below Indifference EBIT
- One above Indifference EBIT

Concept 6 Concept of Capital Structure Theories & Arbitrage

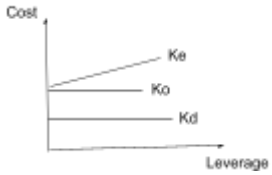
NI Approach



As Leverage Increases
(Debt component increases)

- Kd is constant
- Ke is constant
- Ke > Kd
- Ko (WACC) is falling
- So, Value of firm (VF) will be rising.
  (Ko ↓ , VF ↑)

NOI Approach

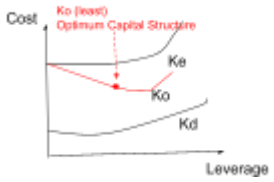


As Leverage increases

- Kd is constant
- Ke will increase
- Ke > KD
- Ko will be constant

→ So, Value of firm will be Constant
(Ko = , VF =)

Traditional Approach



As Leverage increases

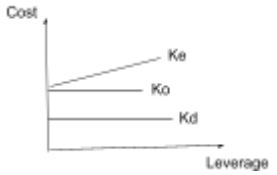
➔ Kd is constant initially then rises.

➔ Ke is constant initially then rises.

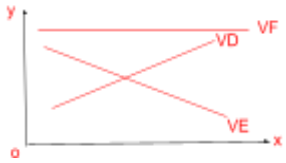
★ Ko falls initially then Ko rises.

★ Optimal capital structure when Ko is minimum.

MM Approach (without Tax)



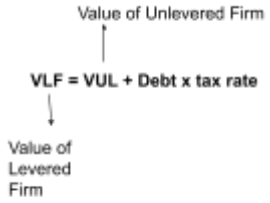
- Same as Noi Approach
- Kd is constant
- Ke rises
- Ko is constant,
- Ko = , VF =



Ke = $Ko+\frac{D}{E}(Ko - Kd)$

MM Approach (with Tax)

As Debt increases, Interest will save tax, so , firm will be valued more.



Earning of Levered Firm =
Earning of Unlevered Firm + Interest Amt × Tax Rate

Steps for Numericals NI

Steps 1: Calculate Net Income (EAES) (NI)

EBIT	xxx
-Int.	(-)
EBT	xxx
-Tax	(=)
EAES = Net Income	

Step 2: Calculate Value of Equity(VE)

$\frac{EAES}{Ke}$

Step 3: Find Value of Firm (VF)

VF = VE + VD

Step 4: Calculate Ko

VF = $\frac{EBIT}{Ko}$

★ **Yaha Ke given hoga aur Ko manga hoga**

Steps for Numericals NOI

Step 1 : Calculate VF

VF = $\frac{EBIT}{KO}$

Step 2: Calculate VE

VF = VD+ VE

Step 3: Calculate EAES

EBIT	xxx
- Int	(-)
EBT	xxx
- Tax	(-)
EAES	= NI

Step 4: Calculate Ke

VE = $\frac{EAES}{Ke}$

★ **Yaha Ko given hoga aur Ke manga hoga.**

$Ko = Ke \times \frac{E}{D+E} + Kd \times \frac{D}{D+E}$

$Ko + \frac{D}{E}(Ko-Kd) = Ke$

Questions 27 : (MTP October 2023)

A Company earns a profit of ₹7,00,000 per annum after meeting its interest liability of ₹1,00,000 on 10% debentures. The Tax rate is 40%. The number of Equity Shares of ₹10 each are 1,00,000 and the retained earnings amount to ₹20,00,000. The company proposes to take up an expansion scheme for which a sum of ₹10,00,000 is required. It is anticipated that after expansion, the company will be able to achieve the same return on investment as at present. The funds required for expansion can be raised either through debt at the rate of 12% or by issuing equity shares at par.

Required:

(i) COMPUTE the Earnings per Share (EPS), if:

- The additional funds were raised as debt
- The additional funds were raised by issue of equity shares.

(ii) ADVISE the company as to which source of finance is preferable.

Solution 27 :

Working Notes:

1. Capital employed before expansion plan:

	(₹)
Equity shares (₹10 × 1,00,000 shares)	10,00,000
Debentures {(₹1,00,000/10) ´ 100}	10,00,000
Retained earnings	20,00,000
Total capital employed	40,00,000

2. Earnings before the payment of interest and tax (EBIT):

	(₹)
Profit (EBT)	7,00,000
Add: Interest	1,00,000
EBIT	8,00,000

3. Return on Capital Employed (ROCE):

$$ROCE = \frac{EBIT}{Capital\ employed} \times 100 = \frac{₹8,00,000}{₹40,00,000} \times 100 = 20\%$$

4. Earnings before interest and tax (EBIT) after expansion scheme:

After expansion, capital employed = ₹40,00,000 + ₹10,00,000
= ₹ 50,00,000

Desired EBIT = 20% x ₹50,00,000 = ₹10,00,000

(i) Computation of Earnings Per Share (EPS) under the following options:

	Present situation	Expansion scheme Additional funds raised as	
		Debt	Equity
	(₹)	(₹)	(₹)
Earnings before Interest and Tax (EBIT)	8,00,000	10,00,000	10,00,000
Less: Interest - Old capital	1,00,000	1,00,000	1,00,000
- New capital	--	1,00,000 (₹10,00,000 x 10%)	--
Earnings before Tax (EBT)	7,00,000	8,00,000	9,00,000
Less: Tax (40% of EBT)	2,80,000	3,20,000	3,60,000
PAT	4,20,000	4,80,000	5,40,000
No. of shares outstanding	1,00,000	1,00,000	2,00,000
Earnings per Share (EPS)	4.20 $\left(\frac{₹4,20,000}{1,00,000}\right)$	4.80 $\left(\frac{₹4,80,000}{1,00,000}\right)$	2.70 $\left(\frac{₹5,40,000}{2,00,000}\right)$

(ii) Advise to the Company: When the expansion scheme is financed by additional debt, the EPS is higher. Hence, the company should finance the expansion scheme by raising debt.

Question 28 : (MTP March 2024)

Capital structure (in market-value terms) of AN Ltd is given below:

Company	Debt	Equity

AN Ltd.	50%	50%

The borrowing rate for the company is 10% in a no-tax world and capital markets are assumed to be perfect.
Required:
(i) If Mr. R, owns 8% of the equity shares of AN Ltd., DETERMINE his return if the Company has net operating income of ₹ 10,00,000 and the overall capitalization rate of the company (Ko) is 20%.
(ii) CALCULATE the implied required rate of return on equity of AN Ltd.

Solution 28 :

Value of AN Ltd. = $\frac{NOI}{k_o}$ = $\frac{₹\ 10,00,000}{20\%}$ = ₹ 50,00,000

(i) **Return on Shares of Mr. R on AN Ltd.**

Particulars	Amount (₹)
Value of the company	50,00,000
Market value of debt (50% x ₹ 50,00,000)	25,00,000
Market value of shares (50% x ₹ 50,00,000)	25,00,000
Particulars	**Amount (₹)**
Net operating income	10,00,000
Interest on debt (10% × ₹ 25,00,000)	2,50,000
Earnings available to shareholders	7,50,000
Return on 8% shares (8% × ₹ 7,50,000)	60,000

(ii) Implied required rate of return on equity of AN Ltd. = $\frac{₹\ 7,50,000}{₹\ 25,00,000}$ = 30%

Question 29 : (Nov 2023)

The data of K Textiles Lid, are given as follows:

Particulars	Amount (₹)
Profit Before Interest and Tax	50,00,000
Less: Interest on debentures @ 10%	10,00,000
Profit before tax	40,00,000
Less: Income tax @ 50%	20,00,000
Profit after tax	20,00,000
No. of equity shares (₹ 10 each)	10,00,000
EPS	2
PE Ratio	10
Market price per share	20

The Company is planning to start a new project needs to be having a total capital outlay of ₹ 40,00,000. You are informed that a debt equity ratio [D/D+E] higher than 36% pushes the Ke (cost of equity) up to 12.5%, means reducing the PE ratio to 8 and rises the interest rate on additional amount borrowed to 12%. Retained earnings of the company is ₹ 1.4 crores.
Find out the probable price of share if:

1. The additional funds are raised as a loan
2. The amount is raised by issuing equity shares.

Solution 29 :

In this question, EBIT after proposed extension is not given. Therefore, we can assume that existing return on capital employed will be maintained.
Working notes:

1. Return on Capital Employed = $\frac{EBIT}{Capital\ Employed}$ = $\frac{₹50,00,000}{₹3,40,00,000}$=14.70%

Capital Employed = Debt + Equity
= ₹ 1,00,00,000 + (₹ 1,00,00,000 + ₹ 1,40,00,000)
= ₹ 3,40,00,000

2. Proposed EBIT = Proposed Capital Employed x Return on capital employed
= (₹ 3,40,00,000 + ₹ 40,00,000) x 14.70% = ₹ 55,86,000

3. Debt Equity Ratio = $\frac{Debt}{Debt+Equity}$

Option1: Loan option

Debt = ₹ 1,00,00,000 + ₹ 40,00,000 = ₹ 1,40,00,000
Equity = ₹ 2,40,00,000
Debt Equity ratio= $\frac{1.4\ cr.}{1.4cr.+\ 2.40\ cr.}$= 36.84%
Debt equity ratio has crossed the limit of 36%, hence, PE ratio in this case will be 8 times and additional borrowing will be at the rate of 12%.

Option2: Equity option
Debt = ₹ 1,00,00,000
Equity = ₹ 2,40,00,000 + ₹ 40,00,000 = ₹ 2,80,00,000
Debt Equity ratio = $\frac{1\ cr.}{1\ cr.+2.8\ cr.}$=26.32%
Debt equity ratio has not crossed the limit of 36% hence PE ratio in this case will remain at 10 times.

4. Number of equity shares to be issued in case of equity option @ ₹ 20 per share
= ₹ 40,00,000 / ₹ 20 = 2,00,000

Calculation of EPS and MPS under two financial options

Particulars	**Financial Options**	
	Option I 12% additional loan of 40,00,000	**Option II 10,00,000 equity shares @ ₹ 10 and 2,00,000 equity shares @ ₹ 20**
	(₹)	**(₹)**
Profit before interest and Tax (PBIT)	55,86,000	55,86,000
Less: Interest on old debentures @ 10%	10,00,000	10,00,000
Less: Interest on additional loan (new) @ 12% on ₹ 40,00,000	4,80,000	Nil
Profit before tax	41,06,000	45,86,000
Less: Taxes @ 50%	20,53,000	22,93,000
Earnings for equity shareholders (EAT/Profit after tax)	20,53,000	22,93,000
Number of Equity Shares	10,00,000	12,00,000
Earnings per Share (EPS)	2.05	1.91
Price/ Earnings ratio	8	10
Market price per share (MPS)	16.42	19.11

Question 30 : (May 2024)
Following data is available in respect of Levered and Unlevered companies having same business risk:
Capital employed = ₹2,00,000, EBIT = ₹25,000 and Ke = 12.5%

Sources	**Levered Company (₹)**	**Unlevered Company (₹)**
Debt (@ 8%)	75,000	Nil
Equity	1,25,000	2,00,000

An investor is holding 12% shares in levered company.Calculate the increase in annual earnings of investor if he switches over his holding from Levered to Unlevered Company.

Solution 30 :

1. Valuation of firms

Particulars	**Levered Firm (₹)**	**Unlevered Firm (₹)**
EBIT	25,000	25,000
Less: Interest on debt (8% × ₹ 75,000)	6,000	Nil
Earnings available to Equity shareholders	19,000	25,000
Ke	12.5%	12.5%
Value of Equity (S) (Earnings available to Equity shareholders/ Ke)	1,52,000	2,00,000
Debt (D)	75,000	Nil
Value of Firm (V) = S + D	2,27,000	2,00,000

Value of a Levered company is more than that of an unlevered company. Therefore, the investor will sell his shares in the levered company and buy shares in the unlevered company. To maintain the level of risk he will borrow a proportionate amount and invest that amount also in shares of the unlevered company.

2. Investment & Borrowings	₹
Sell shares in Levered company (₹ 1,52,000 x 12%)	18,240
Borrow money (₹ 75,000 x 12%)	9,000
Buy shares in Unlevered company	27,240
	₹
3. Change in Return	
Income from shares in Unlevered company (₹ 27,240 x 12.5%)	3,405
Less: Interest on loan (₹ 9,000 x 8%)	720
Net Income from unlevered firm	2,685
Less: Income from Levered firm (₹ 18,240 x 12.5%)	2,280
Incremental Income due to arbitrage	405

Solution can also be done in the following way:
Valuation of firms

Particulars	**Levered Firm (₹)**	**Unlevered Firm (₹)**
EBIT	25,000	25,000
Less: Interest on debt (8% × ₹ 75,000)	6,000	Nil
Earnings available to Equity shareholders	19,000	25,000
Ke	12.5%	12.5%
Value of Equity (S) (Earnings available to Equity shareholders/ Ke)	1,52,000	2,00,000
Debt (D)	75,000	Nil
Value of Firm (V) = S + D	2,27,000	2,00,000

Value of Levered company is more than that of unlevered company. Therefore, investor will sell his shares in levered company and buy shares in unlevered company.

Arbitrage Process:
If investor have 12% shares of levered company, value of investment in equity shares is 12% of ₹ 1,52,000 i.e. ₹ 18,240 and return will be 12% of ₹19,000 = ₹ 2,280.

Alternate Strategy will be:
Sell 12% shares of levered firm for ₹ 18,240 and borrow 12% of levered firm's debt
i.e. ₹ 9,000 (12% of ₹ 75,000) and invest the money i.e. 12% in unlevered firm's stock:
Total resources /Money investor have = ₹ 18,240 + ₹ 9,000 = ₹ 27,240
and investor invest 12% of ₹ 2,00,000 = ₹ 24,000
Surplus cash available with investor is = ₹ 27,240 – ₹ 24,000 = ₹ 3,240
Investor return = 12% EBIT of unlevered firm – Interest to be paid on borrowed funds
i.e. = 12% of ₹ 25,000 – 8% of ₹ 9,000 = ₹ 3,000 – ₹ 720 = ₹ 2,280

Now, return remains the same i.e. ₹ 2,280 which investor is getting from levered company before investing in unlevered company but still have ₹ 3,240 excess money available with investor. Hence, investor is better off by doing arbitrage.

Question 31 : (RTP Sept 2024)
The following data relate to two companies belonging to the same risk class:

Particulars	**A Ltd.**	**B Ltd.**
Expected Net Operating Income	₹ 18,00,000	₹ 18,00,000
12% Debt	₹ 54,00,000	-
Equity Capitalization Rate	-	18

Required:
(a) DETERMINE the total market value, Equity capitalization rate and weighted average cost of capital for each company assuming no taxes as per M.M. Approach.
(b) DETERMINE the total market value, Equity capitalization rate and weighted average cost of capital for each company assuming 40% taxes as per M.M. Approach.

Solution 31 :

(a) Assuming no tax as per MM Approach.

Calculation of Value of Firms 'A Ltd.' and 'B Ltd' according to MM Hypothesis

Market Value of 'B Ltd' [Unlevered(u)]

Total Value of Unlevered Firm (Vu) = [NOI/ke] = 18,00,000/.18

= ₹ 1,00,00,000

Ke of Unlevered Firm (given) = 0.18

Ko of Unlevered Firm (Same as above = ke as there is no debt)

= 0.18

Market Value of 'A Ltd' [Levered Firm (I)]

Total Value of Levered Firm (VL) = Vu + (Debt× Nil) = ₹ 1,00,00,000

+ (54,00,000 × nil)

= ₹ 1,00,00,000

Computation of Equity Capitalization Rate and Weighted Average Cost of Capital (WACC)

	Particulars	A Ltd.	B Ltd.
A	Net Operating Income (NOI)	18,00,000	18,00,000
B	Less: Interest on Debt (I)	6,48,000	-
C	Earnings of Equity Shareholders (NI)	11,52,000	18,00,000
D	Overall Capitalization Rate (ko)	0.18	0.18
E	Total Value of Firm (V = NOI/ko)	1,00,00,000	1,00,00,000
F	Less: Market Value of Debt	54,00,000	-
G	Market Value of Equity (S)	46,00,000	1,00,00,000
H	Equity Capitalization Rate [ke = NI /S]	0.2504	0.18
I	Weighted Average Cost of Capital [WACC] (ko)	0.18	0.18

Assuming 40% taxes as per MM Approach

Calculation of Value of Firms 'A Ltd.' and 'B Ltd' according to MM Hypothesis Approach

Market Value of 'B Ltd' [Unlevered(u)]

Total Value of unlevered Firm (Vu) = [NOI(1 - t)/ke] = 18,00,000 (1 – 0.40)] / 0.18

= ₹ 60,00,000

Ke of unlevered Firm (given) = 0.18

Ko of unlevered Firm (Same as above = ke as there is no debt) = 0.18

Market Value of 'A Ltd' [Levered Firm (I)]

Total Value of Levered Firm (V_L) = V_U + (Debt× Tax)

= ₹ 60,00,000 + (54,00,000 × 0.40)

= ₹ 81,60,000

Computation of Weighted Average Cost of Capital (WACC) of 'B Ltd.'

= 18% (i.e. Ke = Ko)

Computation of Equity Capitalization Rate and Weighted Average Cost of Capital (WACC) of A Ltd

Particulars	A Ltd.
Net Operating Income (NOI)	18,00,000
Less: Interest on Debt (I)	6,48,000
Earnings Before Tax (EBT)	11,52,000
Less: Tax @ 40%	4,60,800
Earnings for equity shareholders (NI)	6,91,200
Total Value of Firm (V) as calculated above	81,60,000
Less: Market Value of Debt	54,00,000
Market Value of Equity (S)	27,60,000
Equity Capitalization Rate [ke = NI/S]	.2504
Weighted Average Cost of Capital (ko)*	13.23

*Computation of WACC A Ltd

Component of Capital	Amount	Weight	Cost of Capital	WACC

Equity	27,60,000	0.338	0.2504	0.0846
Debt	54,00,000	0.662	0.072*	0.0477
Total	81,60,000			0.1323

*Kd= 12% (1- 0.4) = 12% × 0.6 = 7.2%
WACC = 13.23%

Question 32 : (RTP May 2024)
Following data is available in respect of two companies having same business risk:
Capital employed = ₹ 3,00,000, EBIT = ₹ 45,000 and Ke = 12.5%

Sources	A Ltd	B Ltd
	Levered Company (₹)	Unlevered Company (₹)
Debt (@10%)	1,50,000	Nil
Equity	1,50,000	

An investor is holding 20% shares in a levered company. CALCULATE the increase in annual earnings of the investor if he switches his holding from Levered to Unlevered company.

Solution 32 :
(i) Valuation of firms

Particulars	A Ltd	B Ltd
	Levered Firm (₹)	Unlevered Firm (₹)
EBIT	45,000	45,000
Less: Interest on debt (10% × ₹ 1,50,000)	15,000	Nil
Earnings available to Equity shareholders	30,000	45,000
Ke	12.5%	12.5%
Value of Equity (S) (Earnings available to Equity shareholders/Ke)	2,40,000	3,60,000
Debt (D)	1,50,000	Nil
Value of Firm (V) = S + D	3,90,000	3,60,000

Value of a Levered company is more than that of an unlevered company. Therefore, the investor will sell his shares in the levered company and buy shares in the unlevered company. To maintain the level of risk he will borrow a proportionate amount and invest that amount also in shares of the unlevered company.

(ii) **Investment & Borrowings**

	₹
Sell shares in Levered company (₹ 2,40,000 x 20%)	48,000
Borrow money (₹ 1,50,000 x 20%)	30,000
Buy shares in Unlevered company	78,000

(iii) **Change in Return**

	₹
Income from shares in Unlevered company (₹ 78,000 x 12.5%)	9,750
Less: Interest on loan (₹ 30,000 x 10%)	3,000
Net Income from unlevered firm	6,750
Less: Income from Levered firm (₹ 48,000 x 12.5%)	6,000
Incremental Income due to arbitrage	

Question 33 : (Sept 2025)
ER Private Limited has a paid-up capital ₹ 2,50,000 consisting of 25,000 Equity shares of ₹ 10 each. The Market price per share is ₹ 24 with PE ratio of 8. The company is planning to purchase a plant which will cost ₹ 5,00,000. This plant is expected to yield earnings before interest and taxes of ₹ 2,00,000 per annum. It has two alternatives to finance the plant:

Alternatives	Equity	Debt
A	100%	-
B	50%	50%

Other information is as under:

(i) Cost of debt is 12%.
(ii) Equity shares of face value of ₹ 10 each will be issued at a premium of ₹ 10 per share.
(iii) PE ratio of Leveraged company will be 7.
(iv) Tax rate -40%.
Advise which alternative is the most suitable to raise the funds for additional capital, keeping in mind to maximize the benefit to its Shareholders.

Solution 33 :

(b) **Calculation of No. of Equity Shares and Existing Earnings before Interest and Taxes**

Particulars	Existing	Alternative A: Issue Equity shares only	Alternative B: Issue Equity Shares and 12% Debentures of equal amount
Number of Equity Shares			
- Existing	25,000	25,000	25,000
- Newly issued		25,000 $\frac{₹\ 5,00,000}{(₹\ (10+10))}$	12,500 $\frac{₹\ 2,50,000}{(₹(10+10))}$
Total no. of Equity Shares	25,000	50,000	37,500
Calculation of Existing Earnings before Interest and Taxes (EBIT)			
Market Price per share (MPS)	₹ 24		
Price-Earnings Ratio (PE Ratio)	8 times	8 times	7 times
Earning per share (EPS) = MPS/PE Ratio	3		
Earnings after Tax (EAT) = EPS x No. of Equity shares	75,000		
Earning before Tax (EBT) = EAT/0.6 (or EBIT as Interest nil)	1,25,000		

Calculation of EPS and MPS under two financial alternatives

Particulars	Existing	Alternative A	Alternative B
Earnings before Interest and Tax:			
- Existing EBIT	1,25,000	1,25,000	1,25,000
- From New Project		2,00,000	2,00,000
Less: Interest on 12% Debentures	1,25,000 -	3,25,000 -	3,25,000 30,000
Earnings before Tax (EBT)	1,25,000	3,25,000	2,95,000
Less: Tax @ 40%	50,000	1,30,000	1,18,000
Earnings after Tax (EAT)	75,000	1,95,000	1,77,000
EPS = EAT/ No. of Equity Shares	3.00	3.90	4.72
Market Price per share (MPS) = EPS x Price-Earning Ratio	24.00	31.20	33.04

Question 34 : (MTP Sept 2023)

Bhaskar Manufactures Ltd. have Equity Share Capital of ₹ 5,00,000 (face value ₹100) to meet the expenditure of an expansion programme, the company wishes to raise ₹ 3,00,000 and is having following four alternative sources to raise the funds:

Plan A: To have full money from equity shares.
Plan B: To have ₹ 1 lakhs from equity and ₹ 2 lakhs from borrowing from the financial institution @ 10% p.a.
Plan C: Full money from borrowing @ 10% p.a.
Plan D: ₹1 lakh in equity and ₹ 2 lakhs from preference shares at 8% p.a.
The company is expected to have an earning of ₹ 1,50,000. The corporate tax is 50%. Suggest a suitable plan of the above four plans to raise the required funds.

Solution 34 :

Statement showing the EPS under the four plans

	Plan A	Plan B	Plan C	Plan D
Equity share capital	₹ 8,00,000	₹ 6,00,000	₹ 5,00,000	₹ 6,00,000
8% Pref. Share capital	-	-	-	₹ 2,00,000
Borrowing @ 10%	-	₹ 2,00,000	₹ 3,00,000	-
	₹ 8,00,000	₹ 8,00,000	₹ 8,00,000	₹ 8,00,000
E.B.I.T	₹ 1,50,000	₹ 1,50,000	₹ 1,50,000	₹ 1,50,000
Less: Interest @ 10%		₹ 20,000	₹ 30,000	
E.B.T	₹ 1,50,000	₹ 1,30,000	₹1,20,000	₹ 1,50,000
Less: Tax	₹ 75,000	₹65,000	₹60,000	₹ 75,000
Less: Pref Divided				₹ 16,000
Earnings available to equity share holders	₹ 75,000	₹ 65,000	₹ 60,000	₹ 59,000
No.of equity shares (₹100)	8,000	6,000	5,000	6,000
Earning per share	**₹ 9.38**	**₹ 10.83**	**₹ 12.00**	**₹ 9.83**

Plan C given the highest EPS and therefore to be accepted.

Question 35 : Mtp

Sophisticated Limited is considering three financial plans. The key information is as follows:
(a)Total investment amount to be raised ₹ 4,00,000
(b)Plans of Financing Proportion:

Plans	Equity	Debt	Preference Shares
A	100%	-	-
B	50%	50%	-
C	50%	-	50%

(c)Cost of debt 10%
Cost of preference shares 10%
(d)Tax rate 30%
(e)Equity shares of the face value of ₹ 10 each will be issued at a premium of ₹ 10 per share.
(f)Expected EBIT is ₹ 10,00,000.
You are required to DETERMINE for each plan :-

1. Earnings per share (EPS)
2. The financial break-even point.
3. Indicate if any of the plans dominate and compute the EBIT range among the plans for indifference.

Solution 35:

(i) **Computation of Earnings per share (EPS)**

Plans	A	B	C
Earnings before interest and tax (EBIT)	10,00,000	10,00,000	10,00,000
Less: Interest Charges	---	(20,000) (10% x 2 lakh)	---
Earnings before tax (EBIT)	10,00,000	9,80,000	10,00,000
Less: Tax (@30%)	(3,00,000)	(2,94,000)	(3,00,000)
Earnings after tax (EAT)	7,00,000	6,86,000	7,00,000
Less: Preference Dividend	---	---	(20,000) (10% x ₹ 2 Lakh)
Earnings available for equity shareholders (A)	7,00,000	6,86,000	6,80,000

No. of Equity Shares (B)	20,000 (₹ 4 lakh ÷ ₹ 20)	10,000 (₹ 2 lakh ÷ ₹ 20)	10,000 (₹ 2 lakh ÷ ₹ 20)
EPS ₹ [(A) ÷ (B)]	35	68.6	68

(ii) **Calculation of Financial Break-even point**
Financial break-even point is the earnings which are equal to the fixed finance charges and preference dividend.
Plan A: Under this, plan there is no interest payment of ₹ 2,00,000 and no preference dividend. Hence, the Financial Break-even point will be zero.

Plan B: Under this plan, there is an interest payment of ₹ 20,000 and no preference dividend. Hence, the Financial Break-even point will be ₹ 20,000 (Interest charges)

Plan C: Under this plan, there is no interest payment but an after tax preference dividend of ₹ 20,000 is paid. Hence, the Financial Break – even point will be before tax earnings of ₹ 28,571 (i.e. ₹ 20,000 ÷ 0.7)

(iii) **Computation of indifference points between the plans.**
The Indifference between two alternative methods of financing is calculated by applying the following formula.

$$\frac{(EBIT - I1)(1 - T)}{E1} = \frac{(EBIT - I2)(1 - T)}{E2}$$

Where,
EBIT = Earnings before Interest and tax.
I1 = Fixed charges (interest or pref. dividend) under Alternative 1
I2 = Fixed charges (interest or pref. dividend) under Alternative 2
T = Tax rate
E1 = No. of equity shares in Alternative 1
E2 = No. of equity shares in Alternative 2

Now, we can calculate indifference points between different plans of financing.

(a) Indifference point where EBIT of Plan A and Plan B is equal.

$$\frac{(EBIT - 0)(1 - 0.3)}{20{,}000} = \frac{(EBIT - 20{,}000)(1-0.3)}{10{,}000}$$

0.7 EBIT (10,000) = (0.7 EBIT – 14,000) (20,000)
7,000 EBIT = 14,000 EBIT – 28 Crores
EBIT = 40,000

(b) Indifference point where EBIT of Plan A and Plan C is equal

$$\frac{(EBIT - 0)(1 - 0.3)}{20{,}000} = \frac{(EBIT - 0)(1-0.3)}{10{,}000} - 20{,}000$$

0.7 EBIT (10,000) = (0.7 EBIT – 20,000) (20,000)
7,000 EBIT = 14,000 EBIT – 40 crores
EBIT = 57,142.86

(c) Indifference point where EBIT of Plan B and Plan C are equal

$$\frac{(EBIT - 20{,}000)(1 - 0.3)}{10{,}000} = \frac{(EBIT - 0)(1 - 0.3)}{10{,}000} - 20{,}000$$

(0.7 EBIT – 14,000) (10,000) = (0.7 EBIT – 20,000) (10,000)
7,000 EBIT – 14 crore = 7,000 EBIT – 20 crore
There is no indifference point between the financial plans B and C.

Dividend Decisions

I. **Dividend** is that part of profit which the company pays out (gives) to shareholders.

II.

Theories of Dividend	
Relevance of Dividend	**Irrelevance of Dividend**
Company's value will be impacted by dividend decisions. 1. Walter Model 2. Gordon Model	Company's value is not impacted by dividend decisions. 1. M M Approach

III. **Traditional Models:**
- Graham Dodd Model
- Linter's Model

Concept 1. Walter's Model

- Dividend is relevant.

$$P = \frac{\left(D + \frac{(E-D)\times r}{Ke}\right)}{Ke}$$

P = Price of share
D = Dividend per share
E = Earning per share
r = rate of return
Ke = Cost of equity
(E - D) = Retained Earning per share.

Dividend Decision Criteria:
1. If **r > Ke** , Zero optimum Dividend.(All money should be reinvested in business.)
2. If **r = Ke** , Any Dividend Payout is optimum.
3. If **r < Ke ,** 100% Dividend Payout.

➔ It means if company earns less than shareholders expectation, then the company should distribute all earnings as dividend.

Concept 2. Gordon Model

- Dividend is relevant.

$$P = \frac{D1}{Ke - g}$$

D1 = Do(1+g) = Dividend that will be paid at end of year 1.
Ke = Cost of equity (expectation of equity shareholders)
g = Growth rate
Do = Dividend which is already paid at '0' period.

Dividend Decision Criteria:
1. If **r > Ke** , Zero optimum Dividend.(All money should be reinvested in business.)
2. If **r = Ke** , Any Dividend Payout is optimum.
3. If **r < Ke** , 100% Dividend Payout.

Concept 3: How to calculate Growth rate

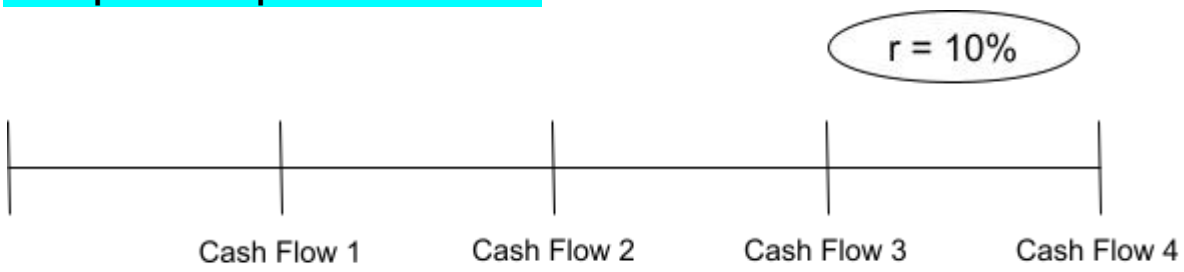
Growth Rate	
$g = \left(\frac{New\ Dividend}{Old\ Dividend}\right)^{\frac{1}{n}} - 1$	**g = b × r** (b = Retention Rate ; r = Rate of return) 1. Dividend Payout Rate + Retention Rate = 100% $\left(\frac{DPS}{EPS} \times 100\right) + \left(\frac{Retained\ EPS}{EPS} \times 100\right) = 100\%$ 2. (1 - b) = Dividend Payout Rate **1 - Dividend Payout Rate = Retention Rate**

Note : If **Ke** is not given , we can estimate Ke by using following formulae.

Ke = $\frac{1}{P/E\ Ratio}$ ⇒ Ke = $\frac{1}{\frac{MPS}{EPS}}$ = $\frac{EPS}{MPS}$

Ke = $\frac{EPS}{MPS}$ = $\frac{1}{P/E\ Ratio}$

Concept 4: Concept of Present Value.



Year	Amount (A)	PV Factor (B)	PV (A × B)
1	CF1	$\frac{1}{(1.10)^1} = 0.909$	*
2	CF2	$\frac{1}{(1.10)^2} = 0.826$	*
3	CF3	$\frac{1}{(1.10)^3} = 0.751$	*
4	CF4	$\frac{1}{(1.10)^4} = 0.683$	*
			Present Value

Concept 5: Types of Questions in Gordon's Model.

No Growth	Constant Growth	Multiple Growth Rate
g = 0 Po = $\frac{D}{Ke-0}$ **Po = $\frac{D1}{Ke}$** Here (Do = D1)	**Po = $\frac{D1}{Ke-g}$** (Constant Growth)	 **Step 1:** Calculate Dividend for D1 , D2 & D3. **Step 2:** Calculate price at start point of constant growth rate. **(Yani 2nd year ke end par P2 nikal lo)** **P2 = $\frac{D3}{Ke-g}$** **Step 3:** Now discount all dividends and terminal price to get **Po.**

Note : Overpriced / Underpriced shares.

a) If **Market price of share > Intrinsic Value** (Value which we calculate)
Share is overpriced in market,
⇒Sell shares if you have it.
⇒Don't buy such shares.

b) If **Market price of share < Intrinsic value**
⇒Share is underpriced in market,
⇒Buy shares
⇒Hold shares if you have them.

Concept 6: M M Approach

(Dividend Irrelevance Theory)

⇒ Value of firm is not dependent on dividend decisions.

Step 1:

Price today of share = PV of (Price & Dividend)

Po = $\left(\frac{P1+D1}{(1+Ke)}\right)$

Step 2: Calculate Number of additional shares (fresh) shares to be issued (Δn)

Amount of Investment made in the year	xxx
Amount of Dividend Distributed	xxx
– Earnings during the year	(--)
Deficit	*
÷ **Price of fresh equity**	÷ **P1**
Additional Shares issued = Δn =	**Δ n**

Step 3: To Verify

Value of firm Today = PV of (Value of firm at end year 1)

n × Po = $\frac{(n+\Delta n)\times P1 + Earnings - Investment\ exp.}{(1+Ke)^1}$

Concept 7: Graham Dodd

P = m$\left(D + \frac{E}{3}\right)$

P = Multiplier$\left(Dividend + \frac{Earning}{3}\right)$

(given)

Concept 8: Linter Model

D1 = Do + $(EPS \times target\ payout\ ratio - Do) \times Af$ **(Adjustment factor or speed of adjustment)**

Question 36 : (MTP March 2024)

The following figures have been extracted from the annual report of Xee Ltd.:

Net Profit	₹ 54 lakhs
Outstanding 12% preference shares	₹ 200 lakhs
No. of equity shares	2 lakhs
Return on Investment	22%
Cost of capital i.e. (Ke)	15%

COMPUTE the approximate dividend pay-out ratio so as to keep the share price at ₹ 120 by using Walter's model? (Decimal may be taken up to 2 units)

Solution 36 :

Particulars	(₹' in lakhs)
Net Profit	54
Less: Preference dividend	24
Earnings for equity shareholders	30
Earnings per share	30/2 = ₹ 15

Let, the dividend per share be D to get share price of ₹ 120.

$$P = \frac{D+\frac{r}{Ke}(E-D)}{ke}$$

Where, P = Market price per share.

E = Earnings per share = ₹ 15 D = Dividend per share

R = Return earned on investment = 22%

Ke = Cost of equity capital = 15%

$$120 = \frac{D+\frac{0.22}{0.15}(15-D)}{0.15}$$

$$18 = \frac{0.15D + 3.3 - 0.22D}{0.15}$$

$0.07D = 3.3 - 2.7$

$D = 8.57$

D/P ratio $= \frac{DPS}{EPS} \times 100 = \frac{8.57}{15} \times 100 = 57.13\%$

So, the required dividend pay-out ratio will be = 57.13%

Question 37 : (Jan 2025)

Following information have been provided by LP Ltd.:

Profit before Tax	₹40 Lakh
Tax Rate	30%
Equity Share Capital (₹10)	₹40 Lakh
Return on investment	18%
Cost of Equity	15%
Dividend Payout Ratio	50%

You are required:

(i) To determine the price of Equity share of the company as per Walter's Model;

(ii) To determine the Dividend Pay-out Ratio by applying Walter's Model assuming the price of equity share of the company is ₹48.

Question 38 : (Nov 2023)

INFO Ltd is a listed company having share capital of ₹ 2400 Crores of ₹ 5 each.

During the year 2022-23

Dividend distributed	1000%
Expected Annual growth rate in dividend	14%
Expected rate of return on its equity capital	18%

Required:

(a) Calculate price of share applying Gordon's growth Model.

(b) What will be the price of share if the Annual growth rate in dividend is only 10%?

(c) According to Gordon's growth Model, if Internal Rate of Return is 25%, then what should be the optimum dividend payout ratio in case of growing stage of company? Comment.

Answer 38 :

(a) In the present situation, the current MPS is as follows:

$P = \frac{Do(1+g)}{Ke-g}$

P = Market price per share
D0 = current year dividend
g = growth rate of dividends
Ke = cost of equity capital/ expected rate of return

$P = \frac{50(1+0.14)}{0.18-0.14}$ = ₹ 1425

(b) The impact of changes in growth rate to 10% on MPS will be as follows:

$P = \frac{50(1+0.10)}{0.18-0.10}$ = ₹ 687.5

(c) If Internal rate of return, r = 25% and Ke = 18%

As per Gordon's model, when r > Ke, optimum dividend payout ratio is 'Zero'. When IRR is greater than cost of capital, the price per share increases and dividend pay- out decreases.

Question 39 : (May 2024)

Vista Limited's retained earnings per share for the year ending 31.03.2023 being 40% is ₹3.60 per share. Company is foreseeing a growth rate of 10% per annum in the next two years. After that the growth rate is expected to stabilize at 8% per annum. Company will maintain its existing pay-out ratio. If the investor's required rate of return is 15%, Calculate the intrinsic value per share as of date using Dividend Discount model.

Solution 39 :

As per Dividend discount model, the price of share is calculated as follows:

Retained earning per share = ₹ 3.60

Dividend per share , $Do = \frac{₹3.60}{40\%} \times 60\%$ = ₹5.40

$D = \frac{D1}{(1+Ke)^1} + \frac{D2}{(1+Ke)^2} + \frac{D3}{(Ke-g)} \times \frac{1}{(1+Ke)^2}$

Where,
P = Price per share
Ke = Required rate of return on equity
g= Growth rate

$D = \frac{5.4 \times 1.1}{(1+0.15)^1} + \frac{5.94 \times 1.1}{(1+0.15)^2} + \frac{6.534 \times 1.08}{(0.15-0.08)} \times \frac{1}{(1+0.15)^2}$

P= 5.17 + 4.94 + 76.23 = ₹86.33
Intrinsic value of share is ₹ 86.33

Question 40 : (MTP October 2023)

PQR Ltd. is a blue-chip company listed in NSE in India with a face value of ₹ 100 per share. The company is expected to grow @ 15% p.a. for next four years then 5% for an indefinite period. The shareholders expect 20% return on their share investments. Company paid ₹ 150 as dividend per share for the current Financial Year. The shares of the company traded at an average price of ₹ 2,052 on last day. FIND out the intrinsic value per share and state whether shares are overpriced or underpriced.

Solution 40 :

As per Dividend discount model, the price of share is calculated as follows:

$P = \frac{D1}{(1+Ke)^1} + \frac{D2}{(1+Ke)^2} + \frac{D3}{(1+Ke)^3} + \frac{D4}{(1+Ke)^4} + \frac{D5}{(Ke-g)} \times \frac{1}{(1+Ke)^4}$

Where,
P = Price per share
Ke = Required rate of return on equity
g = Growth rate

$P = \frac{₹150 \times 1.15}{(1+0.2)^1} + \frac{₹172.5 \times 1.15}{(1+0.2)^2} + \frac{₹198.38 \times 1.15}{(1+0.2)^3} + \frac{₹228.13 \times 1.15}{(1+0.2)^4} + \frac{₹262.35 \times 1.05}{(0.2-0.05)^1} \times \frac{1}{(1+0.2)^4}$

P = 143.75 + 137.76 + 132.02 + 126.52 + 885.63 = ₹ 1425.68

Intrinsic value of share is ₹ 1425.68 as compared to latest market price of ₹ 2052. Market price of a share is overpriced by ₹ 626.32.

Question 41 - Study Material

RST Ltd. has a capital of ₹ 10,00,000 in equity shares of ₹ 100 each. The shares are currently quoted at par. The company proposes to declare a dividend of ₹ 10 per share at the end of the current financial year. The capitalization rate for the risk class of which the company belongs is 12%. COMPUTE market price of the share at the end of the year, if

(i) Dividend is not declared ?

(ii) Dividend is declared ?

(iii) Assuming that the company pays the dividend and has net profits of ₹ 5,00,000 and makes new investments of ₹ 10,00,000 during the period, how many new shares must be issued? Use the MM model.

Solution 41:

Given,

Cost of Equity (K_e)	12%
Number of shares in the beginning (n)	10,000
Current Market Price (P_0)	₹ 100
Net Profit (E)	₹ 5,00,000
Expected Dividend	₹ 10 per share
Investment (I)	₹ 10,00,000

Computation of market price per share, when:

(i) **No dividend is declared:**

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

$100 = \frac{P_1 + 0}{1 + 0.12}$

$P_1 = 112 - 0 = ₹112$

(ii) **Dividend is declared:**

$100 = \frac{P_1 + 10}{1 + 0.12}$

$P_1 = 112 - 10 = ₹102$

(iii) **Calculation of funds required for investment**

Earning	5,00,000
Dividend distributed	1,00,000
Fund available for investment	4,00,000
Total Investment	10,00,000
Balance Funds required	10,00,000 - 4,00,000 = ₹ 6,00,000

No. of shares = $\frac{Funds\ required}{Price\ at\ end(P_1)}$

$\Delta n = \frac{6,00,000}{102}$ = 5882.35 or 5883 shares

Question 42 - Rtp

Rambo Limited Has 1,00,000 equity shares outstanding for the year 2022. The current market price of the shares is ₹ 100 each. Company is planning to pay a dividend of ₹ 10 per share. Required rate of return is 15%. Based on the Modigliani-Miller approach, Calculate the market price of the share of the company when the recommended dividend is 1) declared and 2) not declared.

How many new shares are to be issued by the company at the end of the year on the assumption that net income for the year is ₹ 40 Lac and the investment budget is ₹ 50,00,000 when dividend is declared, or dividend is not declared.

PROOF that the market value of the company at the end of the accounting year will remain the same whether dividends are distributed or not distributed.

Solution 42:

CASE 1: Value of the firm when dividends are not paid.

Step 1: Calculate price at the end of the period

Ke = 15%, P_0 = ₹100, D_1 = 0

$P_o = \frac{P1+D1}{1+Ke}$

₹100 $= \frac{P1+0}{1+0.15}$

P_1 = ₹115

Step 2: Calculation of funds required for investment

Earning	₹ 40,00,000
Dividend distributed	Nil
Fund available for investment	₹ 40,00,000
Total Investment	₹ 50,00,000
Balance Funds required	₹ 50,00,000 - ₹ 40,00,000 = ₹ 10,00,000

Step 3: Calculation of No. of shares required to be issued for balance funds

No. of shares = Funds required/P1

Δn = ₹10,00,000/₹115

Step 4: Calculation of value of firm

nP_o = [(n+Δn)P1-I+E]/(1+Ke)

nP_o = [(100000+1000000/₹115) ₹115 - ₹5000000 + ₹4000000]/(1.15)

= ₹1,00,00,000

CASE 2: Value of the firm when dividends are paid.

Step 1: Calculate price at the end of the period

Ke= 15%, P_o= ₹100, D_1= ₹10

$P_o = \frac{P1+D1}{1+Ke}$

₹100 $= \frac{P1+10}{1+0.15}$

P_1 = ₹105

Step 2: Calculation of funds required for investment

Earning	₹ 40,00,000
Dividend distributed	10,00,000
Fund available for investment	₹ 30,00,000
Total Investment	₹ 50,00,000
Balance Funds required	₹ 50,00,000 - ₹ 30,00,000 = ₹ 20,00,000

Step 3: Calculation of No. of shares required to be issued for balance fund

No. of shares = Funds Required/P1

Δn = ₹2000000/₹105

Step 4: Calculation of value of firm

nP_o = [(n+Δn)P1 – I+E]/(1+Ke)

nP_o = [(100000 + 2000000/₹105) ₹105 – ₹5000000 + ₹4000000]/(1.15)= ₹1,00,00,000

Thus, it can be seen from the above calculations that the value of the firm remains the same in either case.

Question 43 : (Nov 2023)

(i) EPS of a company is ₹ 60 and Dividend payout ratio is 60%. Multiplier is 5. Determine price per share as per Graham & Dodd model.

(ii) Last year's dividend is ₹ 6.34, adjustment factor is 45%, target payout ratio is 60% and current year's EPS is ₹ 12. Compute current year's dividend using Linter's model.

Solution 43 :

(i) Price per share (P) = $m\left(D + \frac{E}{3}\right)$

Where, m = Multiplier , D = Dividend , E = EPS

P = $5\left(60 \times 0.6 + \frac{60}{3}\right)$

P = 5(36 +20) = ₹ 280

(ii) $D_1 = D_o$ + [(EPS ×Target payout) - D_o] × Adjustment factor

D_1 = 6.34 + [(12 × 60%) – 6.34] × 0.45

D_1 = 6.34 + 0.387 = ₹ 6.727

Investment Decision

Traditional Method(Non Discounted)

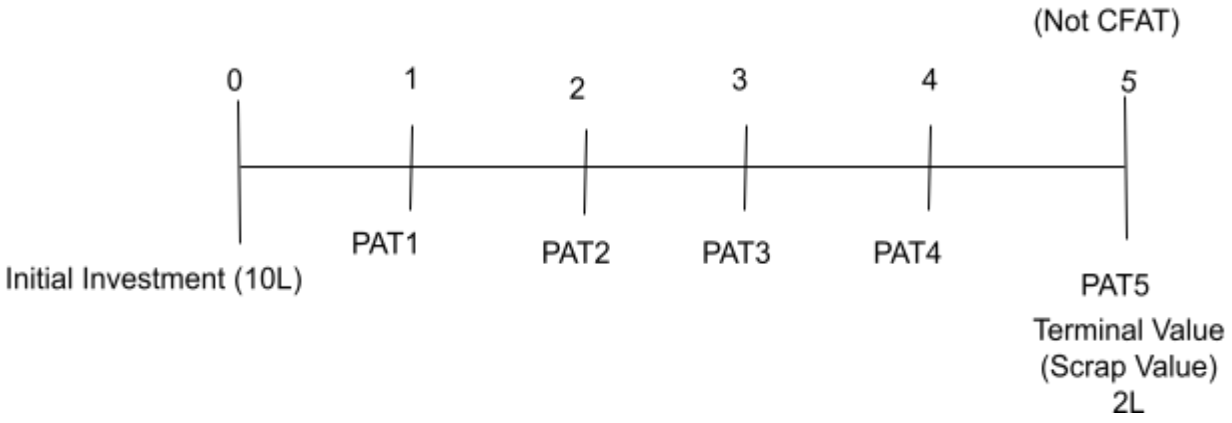
1. Average Rate of Return or Accounting Rate of return (ARR)
2. Payback Period

Modern Methods (Discounted CF Techniques

3. Discounted Payback Period
4. NPV (Net Present Value)
5. Profitability Index (PI) Desirability Index
6. NPV Index
7. Internal Rate of Return (IRR)
8. Modified Internal Rate of Return
9. Payback Reciprocal

Method 1: Average Rate of Return / Accounting Rate of Return (ARR)

Note: It is the only method which uses PAT



Step 1 : Calculate **Average Profit =** $\frac{PAT_1 + PAT_2 + \ldots\ldots + PAT_n}{n}$

Initial Investment = 10,00,000
Terminal Value = 200000

Average Investment = $\frac{Initial\ Investment + TV}{2} = \frac{10+2}{2}$ = 6,00,000

Type 1 ARR = $\frac{Average\ PAT}{Initial\ Investment}$

Type 2 ARR = $\frac{Average\ PAT}{Average\ Investment}$

Concept I. Accounting Profit Vs Cash Flows

Accounting Profit		Cash Flows	
Sales		Sales	xxx
- VC		- VC	(-)
- FC		- FC	(-)
- Depreciation & amortization		- Dep & Amortization	
Profit before Tax		PBT	
- Tax		- Tax	
PAT		PAT	
		+ Dep & Amortization	
		CFAT → Cash flow after tax	

Method 2: Payback Period

We calculate time period in which we get back our investment

Decision - Lower PBP is considered better.

Example:
Initial Investment = ₹ 10,00,000

Year	1	2	3	4	5	6
CFAT	4,00,000	3,00,000	2,00,000	4,00,000	6,00,000	4,00,000

Solution :
Initial Investment = ₹ 10,00,000

Year	Cash Flow	Cumulative CF
1	4,00,000	4,00,000
2	3,00,000	7,00,000
3	2,00,000	**9,00,000**
4	**4,00,000**	13,00,000
5		
6		

PBP = Completed Years + $\frac{(Initial\ Investment - Cumulative\ CFAT)}{CFAT\ of\ Next\ Year}$ **X 1 year or 12 months**

PBP = 3 + $\frac{(10,00,000 - 9,00,000)}{4,00,000}$ x 1 or 12 months
= 3.25 years or 3 years 3 months

Method 3: Discounted Payback Period

This method is same as payback period but we use Discounted CFAT

Example: Initial Investment = ₹ 10,00,000

Year	1	2	3	4	5	6
CFAT	4,00,000	3,00,000	2,00,000	4,00,000	6,00,000	4,00,000

Discounting Rate = 10%. Calculate Discounted PBP

Solution
(i) Initial Investment = ₹ 10,00,000

Year	Cash Flow (A)	PV Factor 10% (B)	PV (A X B)	Cumulative CF
1	4,00,000	0.909	363600	363600
2	3,00,000	0.826	247800	611400
3	2,00,000	0.751	150200	761600
4	4,00,000	0.683	293200	10,34,800
5	6,00,000	0.621		
6	4,00,000	0.564		

Discounted PBP = 3 + $\frac{(10,00,000 - 761600)}{273200}$ x 1 = 3.873 years

Payback Period < Discounted PBP

Method 4 : NPV (Net Present Value)

1. It is one of the most used method
2. While calculating NPV, we actually calculate

	Present Value of Cash Inflows	**PVCI**
-	Present value of Cash Outflow	**PVCO**
	Net Present Value	**NPV**

3. While calculating NPV, we should
   - **Ignore Sunk Cost -** Already Incurred . Ex Research Cost
   - **Ignore Irrelevant Cost -** A cost which will not change in different situation whether we accept Proposal or not.

- **Ignore Apportionable Expenses -** Headoffice expenses are anyhow going to be incurred. So if these expenses are apportioned on proposes they should be ignored
  Ex- General O/H apportioned on Project (should be ignored)

4. PV Kya Hoti hai????
When we bring back future cash flows to today's date, it is called discounting.

$$PV = FV \times \frac{1}{(1+i)^n}$$

5. Format for NPV

Particulars	Year	PV factor 10%	Amount	PV
Outflow:				
Purchase of machine	0	1		
- Sale of Old Machine	0	1		
-Subsidy/Grant	0/1	1/0.909	(x)	✔
Working Capital invested	0	1	*	*
Present Value of Cash Outflow			**PVCO**	**(A)**
Inflows				
Annual CFAT	**1**	**0.909**	$CFAT_1$	✔
	2	**0.826**	$CFAT_2$	✔
	3	**0.751**	$CFAT_3$	✔
	4	**0.683**	$CFAT_4$	✔
Scrap Sle of Asset	**4**	**0.683**	Net Salvage Value	✔
Working capital recovered	4	0.683	WC*	✔
Present Value of Cash Inflow			**PVCI**	**(B)**

Net Present Value (PVCI -PVCO) = (B-A) = ✔

Decision Rule
1. Single Project Question
If **NPV ≥ 0** , Accept Proposal
If **NPV< 0** , Reject Proposal

2. Multi Project Question
Select Project with highest possible NPV.

6. Working Capital
We assume that working capital is recovered back at end of life of project.

7. Basic Notes:
When we buy new asset, we reduce its cost by sale of old asset and subsidies recovered.

8. Golden Rules:
a. Money saved is money earned.
b. Money forgone is money expensed.

Method 5: PI (Profitability Index) Desirability Index.

$$PI = \frac{PVCI}{PVCO} = \frac{Present\ Value\ of\ Cash\ Inflow}{Present\ Value\ of\ Cash\ Outflow}$$

- It is often used for ranking projects.
- **PI** - The Ratio between PVCI and PVCO

Decision Rule :
1. Single Project
If **PI ≥ 0** , Accept Proposal
If **PI < 0** , Reject Proposal

2. Multi Project
Select Project with higher PI

Method 6: NPV Index

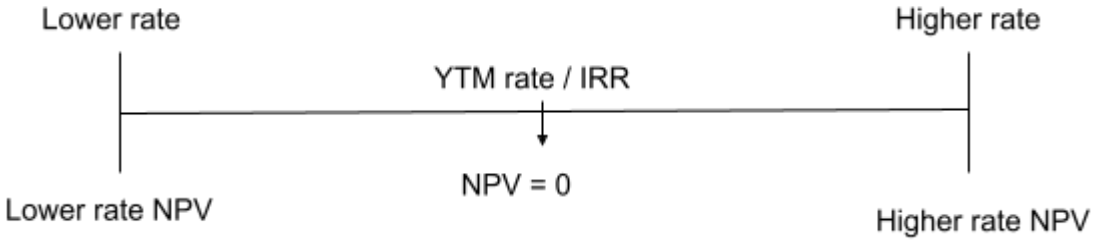
NPV Index = $\frac{NPV}{PVCO}$ = $\frac{PVCI - PVCO}{PVCO}$

NPV Index = PI - 1

Method 7: IRR (Internal Rate of Return)

It means rate at which NPV = 0

	At 5%		At 10%	
	PV Factor	PV	PV Factor	PV
		+100		-60



IRR = Lower rate + Lower rate NPV × $\frac{Difference\ of\ rates}{Difference\ of\ NPV}$

★ If first rate has **(+) NPV**, then increase rate to find **(-)NPV**.
★ If first rate has **(-) NPV**, then decrease rate to find **(+) NPV**.

Explain NPV vs IRR Conflict

Example :	Project A	Project B
NPV	₹ 10,000	₹ 12,000
IRR	11%	9%

NPV vs IRR conflict arises when one project has higher NPV but other project has higher IRR.

Decision: Select proposal having higher NPV.
(because it provides more cash inflow as per wealth maximisation principle.)

Concept : Unequal Life Projects

➔ Divides by cumulative PV factor and find equivalent annual PVCO or NPV and then take decision.

Concept : Format for only Outflow Question

Particulars	Year	PV Factor	Amount	PV
1. Initial Investment (Purchase of Plant)	0			
+ Cash expenses [Amount (1-t)] (Maintenance fuel /Repairs) 2,00,000 (1-30%)	1-5	3.179		
- Tax saving on Depreciation (Dep ×Tax rate)	1-5	3.179		*
			PVCO	

Concept : Tax exp or saving on sale of asset at end. Or capital gain or capital loss.

ex : Purchase = 1,00,000 Life of Asset = 5 Yrs
+ Installation cost = 50,000 Scrap Value = 50,000
Total Asset Cost = 1,50,000

Sale < WDV	Sale = WDV	Sale > WDV
Cost = 1,50,000 - Dep = - **WDV = 50,000**	Cost = 1,50,000 - Dep = - **WDV = 50,000**	Cost = 1,50,000 - Dep = - **WDV = 50,000**
Sale of Asset = 40,000	Sale of Asset = 50,000	Sale of Asset = 80,000
Sale = 40,000 - WDV = -50,000 Capital Loss = 10,000	Sale = 50,000 - WDV = -50,000 CG = 0	Sale price = 80,000 - WDV = -50,000 CG = 30,000
Tax saving on capital loss(40%) = 4000		Tax on CG (30,000×40%) = 12,000
Sale Value = 40,000 + Tax Saving = 4,000 **Cash flow = 44,000**	Sale Value = 50,000 - Tax Saving = - **Cash flow = 50,000**	Sale Value = 80,000 - Tax = -12,000 **Cash flow = 68,000**

Alternative way:

Sale of Asset at end	xxx
- Tax amount on capital gains	(-)
Or	
+ Tax saving on capital loss	(+)
Net cash Inflow from sale of asset	*

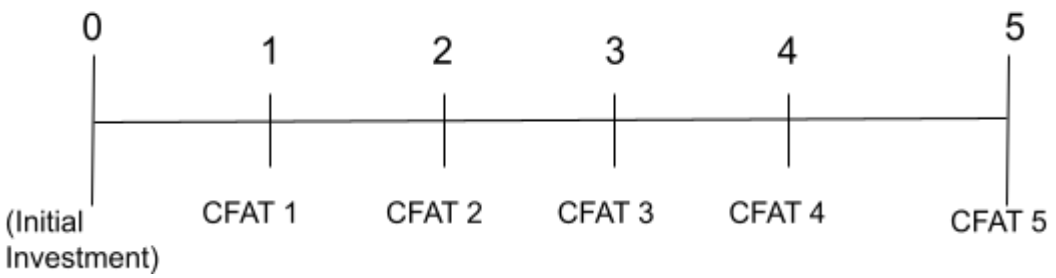
Concept :

Independent Proposal	Mutually Exclusive Proposals
If one event's occurance doesn't influence other event, then they are called Independent proposals. Select Proposal having higher (+) NPV.	If one event occurs, the other event cannot occur. Ex: If you select project A, then you cannot select project B at same time.

Concept : Block of Asset Method Vs Normal Dep Method

Block of Asset	Normal Dep Method
Here all assets belonging to same rate (and same nature) are combined in a block. **Opening value of Block** * **+ Purchase of new asset** + **- Sale of old asset** (-) **Depreciable Amount of Block** *.	Here each asset is depreciated separately.
For our Exam Question **Dep** = $\left(\frac{\text{Purchase of new machine} - \text{Sale of old existing machine}}{n}\right)$ ×**rate**	**Dep**=$\left(\frac{\text{Purchase of new machine} - \text{future scrap value of new machine}}{n}\right)$

Method 8: MIRR (Modified Internal rate of return)



Terminal Value:

1 = $CFAT1(1 + r)^4$
2 = $CFAT2(1 + r)^3$
3 = $CFAT3(1 + r)^2$
4 = $CFAT4(1 + r)^1$
5 = $CFAT5(1 + r)^0$

Initial Investment = Terminal Value $\times \frac{1}{(1+MIRR)^5}$

Step 1: We will reinvest all cash flows (during the life) to terminal date.

	CFAT1 , $(1 + r)^{Remaining\ life}$	=	*
+	CFAT2 , $(1 + r)^{Remaining\ life}$	=	*
+		=	*
+		=	*
	Terminal Value		

Step 2: MIRR is that discounting rate, at which **Terminal Value discounted = Initial Investment**

Initial Investment = Terminal Value $\times \frac{1}{(1+MIRR)^n}$

Method 9: Payback Reciprocal

- It is the reciprocal of Payback period.
- It is calculated in %
- It is used as a proxy for IRR (estimation of IRR) (Tukka for IRR)

Payback Reciprocal $= \frac{Average\ \ Annual\ Inflow}{Initial\ Investment}$

Ex : Initial Investment = ₹ 20,000
Annual Cash Inflow = ₹ 4,000

PBP $= \frac{Initial\ Investment}{Annual\ Cash\ Inflow} = \frac{₹20,000}{₹4,000}$ **= 5 years.**

Payback Reciprocal $= \frac{Annual\ Cash\ flow}{Initial\ Investment} = \frac{4,000}{20,000} \times 100$

Payback Reciprocal = 20%

Concept : Capital Rationing

It is a process by which we try to optimise utilization of total capital available for Investment.
We try to use funds in most profitable manner.

We have limited funds, so we cannot invest in all proposals , therefore we have to choose best earning projects.

Type of Questions	
Divisible Projects	**Indivisible Projects**
Step 1. Calculate NPV **Step 2.** Calculate PI and ranking as per PI (or NPV Index) **Step 3.** Start investing funds from rank 1, onwards. **Step 4.** If at end a proposal cannot be purchased full, then we will invest our remaining capital in it and earn proportioned NPV. **Total NPV of that project** $\times \frac{Amount\ invested\ by\ us}{Total\ investment\ required}$	**Step 1.** Calculate NPV **Step 2.** Calculate PI and rank as per PI (or NPV Index) **Step 3.** Make Various Combinations. (try to use high rank projects) (try to maintain high NPV and use maximum funds.) **Step 4.** Select Highest NPV option combination.

Question 44 : Rtp

A Ltd is considering a new 5-year project. Its investment costs and annual profits are projected as follows:

	Investment	Profits				
Year	0	1	2	3	4	5
Amount(₹)	(2,50,000)	40,000	30,000	20,000	10,000	10,000

Residual Value at the end of the project is expected to be ₹ 40,000 and Depreciation of the Original Investment is on straight line basis. Using Average profits and Average Capital Employed, calculate ARR for the project and also the payback period.

Solution 44:

1. Computation of ARR

Average Rate of Return = $\frac{Average\ Project\ after\ Tax}{Average\ capital\ employed}$

= $\frac{(40{,}000+30{,}000+20{,}000+10{,}000+10{,}000)/5}{(2{,}50{,}000+40{,}000)/2}$

= $\frac{22{,}000}{1{,}45{,}000} \times 100$ = 15.17%

2. Computation of payback period

Depreciation p.a. = $\frac{₹2{,}50{,}000 - ₹40{,}000}{5\ years}$ = ₹ 42,000 per annum.

Year	PAT	Depreciation	CFAT = PAT + Depreciation	Cumulative CFAT
1	₹ 40,000	₹ 42,000	₹ 82,000	₹ 82,000
2	₹ 30,000	₹ 42,000	₹ 72,000	₹ 1,54,000
3	₹ 20,000	₹ 42,000	₹ 62,000	₹ 2,16,000
4	₹ 10,000	₹ 42,000	₹ 52,000	₹ 2,68,000
5	₹ 10,000	₹ 42,000	₹ 52,000	₹ 3,20,000

Simple payback period = 3 + $\frac{₹34{,}000}{₹52{,}000}$ = 3.65 Years.

Question 45 :(MTP Sept 2023)

A firm can make investment in either of the following two projects. The firm anticipates its cost of capital to be 10%. The pre-tax cash flows of the projects for five years are as follows:

Year	0	1	2	3	4	5
Project A (₹)	(3,00,000)	55,000	1,20,000	1,30,000	1,05,000	40,000
Project B (₹)	(3,00,000)	3,18,000	20,000	20,000	8,000	6,000

Ignore Taxation.

An amount of ₹ 45,000 will be spent on account of sales promotion in year 3 in case of Project A. This has not been considered in calculation of pre-tax cash flows.

The discount factors are as under:

Year	0	1	2	3	4	5
PVF (10%)	1	0.91	0.83	0.75	0.68	0.62

You are required to calculate for each project:

(i) The payback period
(ii) The discounted payback period
(iii) Desirability factor
(iv) Net Present Value

Solution 45 :

Calculation of Present Value of cash flows

Year	PV factor @ 10%	Project A		Project B	
		Cash flows (₹)	Discounted Cash flows	Cash flows (₹)	Discounted Cash flows
0	1.00	(3,00,000)	(3,00,000)	(3,00,000)	(3,00,000)
1	0.91	55,000	50,050	3,18,000	2,89,380
2	0.83	1,20,000	99,600	20,000	16,600
3	0.75	85,000(1,30,000-45,000)	63,750	20,000	15,000
4	0.68	1,05,000	71,400	8,000	5,440

5	0.62	40,000	24,800	6,000	3,720
Net Present Value			9,600		30,140

(i) The Payback period of the projects:

Project-A: The cumulative cash inflows up-to year 3 is ₹2,60,000 and remaining amount required to equate the cash outflow is ₹ 40,000 i.e. (₹ 3,00,000 – ₹ 2,60,000) which will be recovered from year-4 cash inflow. Hence, Payback period will be calculated as below:

3 years + $\frac{40,000}{1,05,000}$ = 3.381 years or 3 years, 4 months, 9 days (approx.)

Project-B: The cash inflow in year-1 is ₹ 3,18,000 and the amount required to equate the cash outflow is ₹ 3,00,000, which can be recovered in a period less than a year. Hence, Payback period will be calculated as below:

$\frac{3,00,000}{3,18,000}$ = 0.943 years or 11 months

(ii) Discounted Payback period for the projects:

Project-A: The cumulative discounted cash inflows up-to year 4 is ₹ 2,84,800 and remaining amount required to equate the cash outflow is ₹ 15,200 i.e. (₹ 3,00,000 – ₹ 2,84,800) which will be recovered from year-5 cash inflow. Hence, Payback period will be calculated as below:

4 years + $\frac{15,200}{24,800}$ = 4.613 years or 4 years, 2 months, and 11 days

Project-B: The cash inflow in year-1 is ₹2,89,380 and remaining amount required to equate the cash outflow is ₹ 10,620 i.e. (₹ 3,00,000 – ₹ 2,89,380) which will be recovered from year-2 cash inflow. Hence, Payback period will be calculated as below:

1 year + $\frac{10,620}{16,600}$ = 1.640 years or 1 Year, 7 months and 23 days.

(iii) Desirability factor of the projects

Desirability Factor (Profitability Index) = $\frac{Discounted\ value\ Cash\ Inflows}{Discounted\ value\ of\ Cash\ Outflows}$

Project A = $\frac{3,09,600}{3,00,000}$ = 1,032

Project B = $\frac{3,30,140}{3,00,000}$ = 1,100

(iv) Net Present Value (NPV) of the projects:

Please refer the above table.

Project A- ₹ 9,600

Project B- ₹ 30,140

Question 46 : (MTP October 2023)

A company proposes to install a machine involving a Capital Cost of ₹72,00,000. The life of the machine is 5 years and its salvage value at the end of the life is nil. The machine will produce the net operating income after depreciation of ₹13,60,000 per annum. The Company's tax rate is 35%.

The Net Present Value factors for 5 years are as under:

Discounting Rate	:	14	15	16	17	18	19
Cumulative factor	:	3.43	3.35	3.27	3.20	3.13	3.06

You are required to COMPUTE the internal rate of return (IRR) of the proposal.

Solution 46 :

Computation of cash inflow per annum	**₹**
Net operating income per annum	13,60,000
Less: Tax @ 35%	4,76,000
Profit after tax	8,84,000
Add: Depreciation (₹72,00,000 / 5 years)	14,40,000
Cash inflow	23,24,000

The IRR of the investment can be found as follows:

NPV = - ₹ 72,00,000 + ₹ 23,24,000 (PVAF5, r) = 0

or PVA F5 r (Cumulative factor) = $\frac{72,00,000}{₹23,24,000}$ = 3.09

Computation of Internal Rate of Return (IRR)

Discounting rate	15%	19%
Cumulative factor	3.35	3.06
Total NPV (₹)	77,85,400	71,11,440
	(₹23,24,000 ´ 3.35)	(₹23,24,000 ´ 3.06)
Internal outlay (₹)	72,00,000	72,00,000
Surplus (Deficit) (₹)	5,85,400	(88,560)

IRR = LR + $\frac{NPV\ at\ LR}{NPV\ at\ LR - NPV\ at\ HR}$ × (HR -LR)

= 15% + $\frac{5,85,400}{5,85,400-(-88,560)}$ × (19% -15%)

= 15% +3.47 =18.47%

Note: Lower rate can be 18% or less than 18%. However, there will be no change in the final answer.

Question 47 : (Nov 2023)

ABC Ltd. is considering to purchase a machine which is priced at ₹ 5,00,000. The estimated life of machine is 5 years and has an expected salvage value of ₹ 45,000 at the end of 5 years. It is expected to generate revenues of ₹ 1,50,000 per annum for five years. The annual operating cost of the machine is ₹ 28,125, Corporate Tax Rate is 20% and the cost of capital is 10%.

You are required to analyse whether it would be profitable for the company to purchase the machine by using;

(i) Payback period Method

(ii) Net Present value method

(iii) Profitability Index Method

Solution 47 :

Computation of Annual Cash Flows

Particular	**(₹)**
Revenue	1,50,000
Less: Operating Cost	(28,125)
Less: Depreciation $\frac{(5,00,000-45,000)}{5}$	(91,000)
Profit before Tax	30,875
Less: Tax	(6,175)
Profit after Tax	24,700
Add: Depreciation	91,000
Annual Cash Inflows	1,15,700

(i) Computation of Payback Period

Year	Cash Flows	Cumulative Present Value
1	1,15,700	1,15,700
2	1,15,700	2,31,400
3	1,15,700	3,47,100
4	1,15,700	4,62,800
5 (Including Salvage)	1,60,700	6,23,500

Amount to be recovered in 5th year cash flow = ₹ 5,00,000 – ₹ 4,62,800 = ₹ 37,200

Payback period = 4 years + $\frac{37,200}{1,60,700}$ = 4.23 years

Since the payback period is less than the life of machinery, the company may purchase the machine.

(ii) Computation of Net Present Value

Year	Cash Flows	PVF @10%	Present Value
0	(5,00,000)	1.000	(5,00,000)
1 - 5	1,15,700	3.791	4,38,594
5	45,000	0.621	27,941
Net Present Value			(33,465)

Since the net present value (NPV) is negative, the company should not purchase the machine.

(iii) Computation of Profitability Index (PI)

Profitability Index (PI) $= \frac{Sum\ of\ present\ value\ of\ net\ cash\ inflow}{Initial\ cash\ outflow}$

$= \frac{₹4,38,594+₹27,941}{₹5,00,000} = 0.93$

Since the profitability index is less than 1, the company should not purchase the machine.

Question 48:

HCP Ltd. is a leading manufacturer of railway parts for passenger coaches and freight wagons. Due to high wastage of material and quality issues in production, the General Manager of the company is considering the replacement of machine A with a new CNC machine B. Machine A has a book value of ₹4,80,000 and remaining economic life is 6 years. It could be sold now at ₹1,80,000 and zero salvage value at the end of sixth year. The purchase price of Machine B is ₹24,00,000 with an economic life of 6 years. It will require ₹1,40,000 for installation and ₹60,000 for testing. Subsidy of 15% on the purchase price of machine B will be received from the Government at the end of 1st year. Salvage value at the end of sixth year will be ₹3,20,000.

The General manager estimates that the annual savings due to installation of Machine B include a reduction of three skilled workers with annual salaries of ₹1,68,000 each, ₹4,80,000 from reduced wastage of materials and defectives and ₹3,50,000 from loss in sales due to delay in execution of purchase orders. Operation of Machine B will require the services of a trained technician with an annual salary of ₹3,90,000 and annual operation and maintenance cost will increase by ₹1,54,000. The company's tax rate is 30% and it's required rate of return is 14%. The company follows a straight line method of depreciation. Ignore tax savings on loss due to sale of existing machine.

The present value factors at 14% are:

Years	0	1	2	3	4	5	6
PV Factor	1	0.877	0.769	0.675	0.592	0.519	0.456

Required:

(i) Calculate the Net Present Value and profitability Index and advise the company for a replacement decision.

(ii) Also Calculate the discounted pay-back period.

Solution 48 :

Calculation of Net Initial Cash Outflows:

Particulars	**₹**
Cost of new machine	24,00,000
Less: Sale proceeds of existing machine	(1,80,000)
Add: Installation	1,40,000
Add: Testing	60,000
Less: Subsidy from government (15% of 24,00,000) x 0.877	(3,15,720)
Net initial cash outflows	21,04,280

Calculation of Incremental Depreciation

Particulars	**₹**
Depreciation on existing machine (4,80,000/6) (i)	80,000
Depreciation base of New Machine	
Cost of new machine	24,00,000
Add: Installation	1,40,000
Add: Testing	60,000
Less: Subsidy from government	(3,60,000)
Less: Salvage value at the end of 6th year	(3,20,000)
Depreciation base of New Machine	19,20,000
Depreciation on New Machine (19,20,000/6) (ii)	3,20,000
Incremental depreciation [(ii) – (i)]	2,40,000

Computation of Annual Operating Cash flow after tax (CFAT)

Particulars	**Amount (₹)**	**Amount (₹)**
Savings in cost		
Cost of 3 skilled workers (₹1,68,000 x 3)	5,04,000	

Reduced wastage of material	4,80,000	
Saving in loss of sales	3,50,000	
Total		13,34,000
Less: Increase in cost		
Salary to trained technician	3,90,000	
Increase in annual operation and maintenance cost	1,54,000	
Total		(5,44,000)
Incremental Saving before tax and depreciation		7,90,000
Less: Incremental Depreciation		(2,40,000)
Incremental PBT		5,50,000
Less: Tax @30%		(1,65,000)
PAT		3,85,000
Add: Depreciation		2,40,000
Incremental CFAT		6,25,000

Calculation of NPV

Particulars	Year	Net Cashflow (₹)	PVF @14%	PV (₹)
Net initial cash outflows	0	(24,20,000)	1	(21,04,280)
Incremental CFAT	1 to 6	6,25,000	3.888	24,30,000
Salvage Value of New Machine	6	3,20,000	0.456	1,45,920
PV of inflows				25,75,920
Net Present Value				**4,71,640**

Profitability Index = $\frac{Sum\ of\ discounted\ cash\ inflows}{Initial\ cash\ outlay\ or\ Total\ discounted\ cash\ outflow\ (as\ the\ case\ may\ )}$ = 25,75,920/21,04,280= 1.224

Advise: Since the NPV is positive and PI is greater than 1, the company should replace the machine

Computation of Discounted Payback Period

Year	Cashflow	PVF @ 14%	PV of CFs (₹)	Cumulative PV (₹)
1	6,25,000	0.877	5,48,125	5,48,125
2	6,25,000	0.769	4,80,625	10,28,750
3	6,25,000	0.675	4,21,875	14,50,625
4	6,25,000	0.592	3,70,000	18,20,625
5	6,25,000	0.519	3,24,375	21,45,000
6	9,45,000	0.456	4,30,920	25,75,920

Discounted Payback Period = 4 + $\frac{21,04,280-18,20,625}{3,24,375}$ = **4.87 years**

If we take subsidy in cash inflow of 1st year, then solution can also be done in the following way:

Calculation of Net Initial Cash Outflows:

Particulars	₹
Cost of new machine	24,00,000
Less: Sale proceeds of existing machine	(1,80,000)
Add: Installation	1,40,000
Add: Testing	60,000
Net initial cash outflows	**24,20,000**

Note: However, Incremental Depreciation and CFAT will remain the same.

Calculation of NPV

Particulars	Year	Net Cashflow (₹)	PVF @14%	PV (₹)
Net initial cash outflows	0	(24,20,000)	1	(24,20,000)
Subsidy	1	3,60,000	0.877	3,15,720
Incremental CFAT	1 to 6	6,25,000	3.888	24,30,000
Salvage Value of New Machine	6	3,20,000	0.456	1,45,920
PV of inflows				28,91,640
Net Present Value				**4,71,640**

Profitability Index = $\frac{Sum\ of\ discounted\ cash\ inflows}{Initial\ cash\ outlay\ or\ total\ discounted\ cash\ outflow\ (as\ the\ case\ may)}$ = 28,91,640 /24,20,000 = 1.195

Advise: Since the NPV is positive and PI is greater than 1, the company should replace the machine

Computation of Discounted Payback Period

Year	Cashflow	PVF @ 14%	PV of CFs (₹)	Cumulative PV (₹)
1	9,85,000	0.877	8,63,845	8,63,845
2	6,25,000	0.769	4,80,625	13,44,470
3	6,25,000	0.675	4,21,875	17,66,345
4	6,25,000	0.592	3,70,000	21,36,345
5	6,25,000	0.519	3,24,375	24,60,720
6	9,45,000	0.456	4,30,920	28,91,640

Discounted Payback Period = $4 + \frac{24,20,000 - 21,36,345}{3,24,375}$ = **4.87 years**

Question 49: (Jan 2025)

SRT Limited manufactures steel rods and is now considering to purchase a new aluminium smelting and moulding plant. This plant will have the cost of ₹20,00,000 to purchase and install the plant. It has a useful life of 5 years with a residual value of ₹1,00,000. Production and sales from the new plant are expected to be 1,00,000 units per year. Other estimates are as follows:

Selling price	₹150 per unit
Direct Cost	₹100 per unit

Fixed cost (including depreciation) is ₹8,00,000 per annum. Marketing and and promotion cost not included in the above will be ₹1,00,000 and ₹1,60,000 for years 1 and 2, respectively.

Additionally , investment in debtors and stocks will increase in year 1 by ₹1,50,000and ₹2,00,000 respectively. Creditors will also increase by ₹1,00,000 in year 1. Thus , Debtors, stocks and creditors will be recouped at the end of the fifth year.

The cost of capital is 18%. Corporate tax is 30% and is paid in the year in which profits are made. Depreciation is tax deductible. The company follows straight line method of depreciation.

Required:

(i) Calculate the Net Present Value and Profitability Index of the project.

(ii) Advise SRT Limited whether the plant should be purchased.

The PV factors at 18% are:

Year	1	2	3	4	5
PV factor	0.847	0.718	0.609	0.516	0.437

Question 50 - Study Material

An investment of ₹ 1,36,000 yields the following cash inflows. Determine the MIRR if the Cost of Capital = 8%

Year	1	2	3	4	5
CFAT(RS)	30,000	40,000	60,000	30,000	20000

Solution 50:

1. Conversion of Cash Flows into Terminal Value

Year	CFAT	Reinvestment Factor at 8%	Terminal Value at 8%
1	30,000	$(1 + 0.08)^4 = 1.3605$	40,815
2	40,000	$(1 + 0.08)^3 = 1.2597$	50,388
3	60,000	$(1 + 0.08)^2 = 1.1664$	69,984
4	30,000	$(1 + 0.08)^1 = 1.0800$	32,400
5	20,000	$(1 + 0.08)^0 = 1.0000$	20,000
		Total	2,13,587

2. Computation of MIRR

$P (1 + R)^n = A$,

Where P = Initial Investment = ₹ 1,36,000, A = Terminal Value of Inflows = ₹ 2,13,587

N = Number of years of Project Life = 5, R = MIRR (to be calculated)

$\therefore 1,36,000 (1 + R)^5 = 2,13,587.$

Hence, $(1 + R)^5 = \frac{2,13,587}{1,36,000} = 1.5705$

From the FV Tables, $(1 + R) = 1.5705^{1/5} = 1.09448.$

So, R = 0.09448. Hence, MIRR = 9.448%

Question 51 - Study Material

Suppose a project requires an initial investment of ₹ 20,000 and it would give annual cash inflow of ₹ 4,000. The useful life of the project is estimated to be 5 years. What will be the Payback Reciprocal?

Solution 51:

Payback Reciprocal = $\frac{₹4,000 \times 100}{₹20,000}$ = 20%

Question 52 :(RTP Nov 2023)

PQR Limited is considering buying a new machine which would have a useful economic life of five years, at a cost of ₹ 40,00,000 and a scrap value of ₹ 5,00,000, with 80 per cent of the cost being payable at the start of the project and 20 per cent at the end of the first year. The machine would produce 80,000 units per annum of a new product with an estimated selling price of ₹ 400 per unit. Direct costs would be ₹ 375 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be ₹ 10,40,000 per annum.

In the first year and the second year, special sales promotion expenditure, not included in the above costs, would be incurred, amounting to ₹ 1,25,000 and ₹ 1,75,000 respectively.

EVALUATE the project using the NPV method of investment appraisal, assuming the company's cost of capital to be 12 percent.

Solution 52 :

Calculation of Net Cash flows

Contribution = (400 – 375) ´ 80,000 = ₹ 20,00,000

Fixed costs = 10,40,000 – [(40,00,000 – 5,00,000)/5] = ₹ 3,40,000

Year	Capital (₹)	Contribution (₹)	Fixed costs (₹)	Promotion (₹)	Net cash flow (₹)
0	(32,00,000)				(32,00,000)
1	(8,00,000)	20,00,000	(3,40,000)	(1,25,000)	7,35,000
2		20,00,000	(3,40,000)	(1,75,000)	14,85,000
3		20,00,000	(3,40,000)		16,60,000
4		20,00,000	(3,40,000)		16,60,000
5	5,00,000	20,00,000	(3,40,000)		21,60,000

Calculation of Net Present Value

Year	Net cash flow (₹)	12% discount factor	Present value (₹)
0	(32,00,000)	1.000	(32,00,000)
1	7,35,000	0.893	6,56,355
2	14,85,000	0.797	11,83,545
3	16,60,000	0.712	11,81,920
4	16,60,000	0.636	10,55,760
5	21,60,000	0.567	12,24,720
			21,02,300

The net present value of the project is **₹21,02,300.**

Question 53 : (MTP April 2024)

An existing profitable company, RMC World Ltd. is considering a new project for manufacture of home automation gadget involving a capital expenditure of ₹ 1000 Lakhs and working capital of ₹ 150 Lakhs. The capacity of the plants for an annual production of 3 lakh units and capacity utilization during 5 year life of the project is expected to be as indicated below:

Year	1	2	3	4	5
Capacity Utilization (%)	50	65	80	100	100

The average price per unit of product is expected to be ₹600 netting a contribution of 60 percent. The annual fixed costs, excluding depreciation, are estimated to be ₹500 Lakhs per annum from the third year onwards. For the first and second year, it would be ₹ 200 lakhs and ₹ 350 lakhs respectively.

Scrap value of the capital asset at the end of 5th year is ₹ 200 Lakhs. Depreciation on capital assets is provided on a written down value basis @ 40% p.a. for income tax purposes. The rate of income tax may be

taken at 30%. The cost of capital is 12%. At the end of the third year an additional investment of ₹ 200 lakhs would be required for working capital. There is no capital gain tax applicable.

COMPUTE the NPV of the project. RMC World Ltd. is about to make a presentation to a Secure Venture Capital Firm. Secure Venture Capital Firms will invest in any project if the net addition to shareholder wealth from the project is above ₹ 100 lakhs.

Solution 53 :

Calculation of Cash Flow after Tax

	Year 1	Year 2	Year 3	Year 4	Year 5
Capacity	50%	65%	80%	100%	100%
Units	1,50,000	1,95,000	2,40,000	3,00,000	3,00,000
Contribution p.u.	360	360	360	360	360
(600 x 60%)					
Total Contribution	5,40,00,000	7,02,00,000	8,64,00,000	10,80,00,000	10,80,00,000
Less: Fixed Asset	2,00,00,000	3,50,00,000	5,00,00,000	5,00,00,000	5,00,00,000
Less: Depreciation (W.N.)	4,00,00,000	2,40,00,000	1,44,00,000	86,40,000	51,84,000
PBT	(60,00,000)	1,12,00,000	2,20,00,000	4,93,60,000	5,28,16,000
Less: Tax	(18,00,000)	33,60,000	66,00,000	1,48,08,000	1,58,44,800
PAT	(42,00,000)	78,40,000	1,54,00,000	3,45,52,000	3,69,71,200
Add: Depreciation	4,00,00,000	2,40,00,000	1,44,00,000	86,40,000	51,84,000
CFAT	3,58,00,000	3,18,40,000	2,98,00,000	4,31,92,000	4,21,55,200

Calculation of NPV

Year	Description	Cash Flow	PVF @12%	PV
0	Initial Investment	(10,00,00,000)	1	(10,00,00,000)
0	WC introduced	(1,50,00,000)	1	(1,50,00,000)
3	WC introduced	(2,00,00,000)	0.7118	(1,42,36,000)
1	CFAT	3,58,00,000	0.8929	3,19,65,820
2	CFAT	3,18,40,000	0.7972	2,53,82,848
3	CFAT	2,98,00,000	0.7118	2,12,11,640
4	CFAT	4,31,92,000	0.6355	2,74,48,516
5	CFAT	4,21,55,200	0.5674	2,39,18,860
5	WC released	3,50,00,000	0.5674	1,98,59,000
5	Scrap Sale	2,00,00,000	0.5674	1,13,48,000
	Net Present Value			3,18,98,684

Working Notes (W.N.)

Calculation of Depreciation

Year	Opening WDV	Depreciation	Closing WDV
1	10,00,00,000	4,00,00,000	6,00,00,000
2	6,00,00,000	2,40,00,000	3,60,00,000
3	3,60,00,000	1,44,00,000	2,16,00,000
4	2,16,00,000	86,40,000	1,29,60,000
5	1,29,60,000	51,84,000	77,76,000

Question 54 - Study Material

Ae Bee Cee Ltd. is planning to invest in machinery, for which it has to make a choice between the two identical machines, in terms of Capacity, 'X' and 'Y'. Despite being designed differently, both machines do the same job. Further, details regarding both the machines are given below:

Particulars	Machine 'X'	Machine 'Y'
Purchase Cost of the Machine (₹)	15,00,000	10,00,000
Life (years)	3	2
Running cost per year (₹)	4,00,000	6,00,000

The opportunity cost of capital is 9%. You are required to:

IDENTIFY the machine the company should buy? The present value (PV) factors at 9% are:

Year	t1	t2	t3
PVIF0.09.t	0.917	0.842	0.772

Solution 54:

Statement Showing the Evaluation of Two Machines

	Particulars	Machine 'X'	Machine 'Y'
(i)	Purchase Cost	₹ 15,00,000	₹ 10,00,000
(ii)	Life of Machine	3 years	2 years
(iii)	Running Cost of Machine per year	₹ 4,00,000	₹ 6,00,000
(iv)	PVIFA (0.09, 3)	2.531	
	PVIFA (0.09, 2)		1.759
(v)	PV of Running Cost of Machine {(iii) × (iv)}	₹ 10,12,400	₹ 10,55,400
(vi)	Cash outflows of Machine {(i) + (v)}	₹ 25,12,400	₹ 20,55,400
(vii)	Equivalent PV of Annual Cash outflow {(vi)/(iv)}	₹ 9,92,651	₹ 11,68,505

Recommendation: Ae Bee Cee Ltd. should buy Machine 'X' since equivalent annual cash outflow is less than that of Machine 'Y'.

Question 55 -

ABC Ltd. manufactures toys and other gift items. The R & D Division has come up with a product that would make a good promotional gift for office equipment dealers. As a result of efforts by the sales personnel, the Firm has commitments for this product.

To produce the quantity demanded, the company will need to buy additional machinery and rent additional space. It appears that about 25,000 square feet will be needed. 12,500 square feet of presently unused space, but leased at the rate of ₹ 3 per square foot per year, is available. There is another 12,500 square feet available at an annual rent of ₹ 4 per square foot.

The Machinery will be purchased for ₹ 9,00,000. It will require ₹ 30,000 for modifications, ₹ 60,000 for installation and ₹ 90,000 for testing. The machinery will have a salvage value of about ₹ 1,80,000 at the end of the third. No additional General Overheads Costs are expected to be incurred.

The estimated revenues and costs for this product for the three years have been developed as follows:(₹)

Particulars	Year I	Year II	Year III
Sales	10,00,000	20,00,000	8,00,000
Less: Material and	4,00,000	7,50,000	3,50,000
Labour	40,000	75,000	35,000
Overheads allocated	50,000	50,000	50,000
Rent	3,00,000	3,00,000	3,00,000
Depreciation			
Earnings Before	2,10,000	8,25,000	65,000
Taxes	1,05,000	4,12,500	32,500
Less: Taxes			
Earnings After Taxes	1,05,000	4,12,500	32,500

If the Company sets a required rate of return of 20% after taxes, should this product be manufactured?

Solution 55:

1. Initial Investment = Machine Purchase price + Modification charges + Installation Charges + Testing Charges
   = ₹ 9,00,000 + ₹ 30,000 + ₹ 60,000 + ₹ 90,000 = ₹ 10,80,000.
2. Salvage Value = ₹ 1,80,000
3. Life = 3 years
4. Depreciation p.a. = $\frac{₹10,80,000 - ₹1,80,000}{3\ years}$ = ₹ 3,00,000 (same as charged in P&L Account given in Question).
5. **Computation of CFAT p.a. and NPV:(In ₹)**

Particulars	Year I	Year II	Year III
Sales	10,00,000	20,00,000	8,00,000
Less: Relevant Costs:			

Materials and Labour	(4,00,000)	(7,50,000)	(3,50,000)
Rent Expense	(50,000)	(50,000)	(50,000)
Depreciation	(3,00,000)	(3,00,000)	(3,00,000)
Rent Income foregone	(37,500)	(37,500)	(37,500)
Total Costs	7,87,500	11,37,500	7,37,500
Profit After Tax	2,12,500	8,62,500	62,500
Less: Tax at 50%	(1,06,250)	(4,31,250)	(31,250)
Profit After Tax	1,06,250	4,31,250	31,250
Add: Depreciation	3,00,000	3,00,000	3,00,000
CFAT	4,06,250	7,31,250	3,31,250
Add: Salvage value of Machine	-	-	1,80,000
PVF at 20%	0.8333	0.6944	0.5787
Present Value	3,38,528 (a)	5,07,780 (b)	2,95,860 (c)
Total Present Value (a) + (b) + (c)	11,42,168		
Less: Initial Investment	10,80,000		
NPV	62,168		

Question 56 - Study Material

Elite Cooker Company is evaluating three investment situations: (1) Produce a new line of aluminium skillets, (2) expand its existing cooker line to include several new sizes, and (3) develop a new, higher-quality line of cookers. If only the project in question is undertaken, the expected present value and the amounts of investment required are:

Project	Investment required (₹)	Present value of Future Cash-Flows (₹)
1	2,00,000	2,90,000
2	1,15,000	1,85,000
3	2,70,000	4,00,000

If projects 1 and 2 are jointly undertaken, there will be no economies; the investment required and preset value will simply be the sum of the parts. With projects 1 and 3, economies are possible in investment because one of the machines acquired can be used in both production processes. The total investment required for projects 1 and 3 combined is ₹ 4,40,000.If projects 2 and 3 are undertaken, there are economies to be achieved in Marketing and producing the products but not in investment. The expected present value of future cash flows for projects 2 and 3 is ₹ 6,20,000. If all three projects are undertaken simultaneously, the economies noted will still hold. However, a ₹ 1,25,000 extension on the plant will be necessary, as space is not available for all three projects. Which project or projects should be chosen?

Solution 56:

Project	Investment Required	Present value of Future Cash Flows	Net Present value
	₹	₹	₹
1	2,00,000	2,90,000	90,000
2	1,15,000	1,85,000	70,000
3	2,70,000	4,00,000	1,30,000
1 and 2	3,15,000	4,75,000	1,60,000
1 and 3	4,40,000	6,90,000	2,50,000
2 and 3	3,85,000	6,20,000	2,35,000
1, 2 and 3 (Refer Working note)	6,80,000*	9,10,000	2,30,000

Working Note:

(i) Total Investment required if all the three projects are undertaken simultaneously:

	(₹)
Project 1& 3	4,40,000
Project 2	1,15,000
Plant extension cost	1,25,000
Total	6,80,000

(ii) Total of Present value of Cash flows if all the three projects are undertaken simultaneously:

	(₹)
Project 2& 3	6,20,000

Project 1	2,90,000
Total	9,10,000

Projects 1 and 3 should be chosen, as they provide the highest net present value.

Question 57 - Pyq

A company has ₹ 1,00,000 available for investment and has identified the following four investments in which to invest.

Project	Investment (₹)	NPV (₹)
C	40,000	20,000
D	1,00,000	35,000
E	50,000	24,000
F	60,000	18,000

You are required to optimize the returns from a package of projects within the capital spending limit if:

(i) The projects are independent of each other and are divisible.

(ii) The projects are not divisible.

Working Capital Management

Topic 1: Operating Cycle

Time taken for cash to return back to cash in a business.

Calculation of Operating Cycle

Particulars	Days
RM holding period = $\frac{Average\ RM}{RM\ consumed} \times 365$	*
WIP Conversion period = $\frac{Average\ WIP}{(100\%\ RM\ consumed + 50\%\ Labour\ and\ OH)\ or\ Cost\ of\ Production} \times 365$	*
FG Holding Period (Stock Velocity)= $\frac{Average\ FG}{COGS} \times 365$	*
Debtors Collection Period(ACP)(Debtors Velocity)= $\frac{Average\ Debtors}{Credit\ Sales} \times 365$	*
- Creditors Payment Period(Creditors Velocity)= $\frac{Average\ Creditors}{Credit\ Purchases} \times 365$	(-)
Operating Cycle Period	**Days**

Concept 2:

1. **Number of operating cycles in a year (or Cash Cycle Turnover) = $\frac{365}{Operating\ Cycle\ Period}$ Times**
2. **Working Capital estimation = $\frac{Cash\ operating\ exp\ in\ a\ year}{365} \times Operating\ cycle\ period$**

Total Operating Expenses	xxx
- Depreciation / Amortization (Non Cash Exp)	xxx
Cash Operating Expenses	xxx

Topic 2: Estimation of WC Requirement

Concept 1: Total Basis Vs Cash Cost Basis

Total Basis	Cash cost Basis
• Here we include Depreciation and Profit in calculation of WC.	• Here we exclude Depreciation and Profit in calculation of WC.

Note :

	Total Basis
-	Depreciation (Non Cash Exp)
	Cash Basis
-	Profit
	Cash Cost Basis

Concept 2: Format of Cost Sheet. (Long Format)

Particulars	Amount (₹)
Raw Material Purchased	xxx
+ Operating Stock of RM	
- Closing Stock of RM	
Raw Material Consumed	xxx
+ Direct Labour	+
+ Direct Expenses	+
Prime Cost	*
+ Factory O/H (works O/H / Production O/H / Manufacturing O/H)	+
Gross Works Cost / Factory Cost	*
+ Op WIP	+
+ Cl WIP	-
Net Factory Cost	xxx
+ Quality Control	
+ Research & Development	
+ Admin (Production Related)	

+ Primary Packing - Scrap Sale	
Cost of Production + Opening FG + Closing FG	*
COGS + Selling & Distribution O/H + Admin (General)	*
Cost of Sales - Profit	
Sales	**

Used in case of new company question. **[Opening stock will be Zero, closing stocks will not be Zero]**

Cost Sheet (Short Format)

RM Consumed / Purchased + Direct Labour + Direct Expenses	* +
Prime Cost + Factory O/H	*
Factory Cost / Works Cost + Admin (Production nature)	* +
Cost of Production / exp + Selling & Distribution O/H + Admin (General)	*
Cost of Sales + Profit	*
Sales	*

Used in case of existing /Old company Question
We assume **Op stock = Cl stock** . So, they get cancelled, thus we don't show them in Cost Sheet.

Note -

Old Company	New Company
Short Cost Sheet	**Long Cost Sheet**
Op Stock = Cl Stock	Op Stock ≠ Cl Stock Op Stock = 0 Cl Stock ≠ 0
RM Consumed = RM Purchased	RM Consumed ≠ RM Purchased

Estimation of WC

Particulars	Amount (₹)
Current Assets • **Raw Material** = RM Consumed × $\frac{n}{12/52/365}$ • **WIP** = (RM×100% + Labour & OH × 50%) × $\frac{n}{12/52/365}$ OR (Factory Cost)× $\frac{n}{12/52/365}$ • **FG Stock** = cost of production× $\frac{n}{12/52/365}$ • **Debtors** = (Total Basis Question) = Credit Sales× $\frac{n}{12/52/365}$ (Cash Cost Basis Question) = Cash cost of Sales × $\frac{n}{12/52/365}$ • **Advance to Suppliers** • **Cash / Bank Balance** (Mentioned in question)	
Total Current Asset (A)	**(A)**
Current Liabilities • **Creditors** = RM Purchased × $\frac{n}{12/52/365}$ • **O/S Wages** = Annual Wages × $\frac{n}{12/52/365}$	

• **O/S Expenses** = Cash Expenses × $\frac{n}{12/52/365}$	
Total Current Liabilities (B)	**(B)**
Excess of CA over CL (A-B) + Safety Margin for contingency	
Net WC required	

General Knowledge Note:
Conversion Cost → Labour Cost + Overhead Cost

Topic 3: Management of Receivables

Debtors Management

Option 1. Liberalise Credit Policy (Increase Credit Period)

Benefits	Costs
1. Increased sales and contribution.	1. Increased Bad Debt. 2. Interest Cost on Debtors Cost. 3. Increased Collection Cost. 4. Increase Admin Cost.

Option 2. Strict Credit Policy (Reduce Credit Period)

Benefit	Costs
1. Reduced Bad Debt 2. Reduced Interest lost on Debtors Cost 3. Reduced Collection Cost	1. Reduced contribution & Sales.

Note: Solution Method
- Total Approach (easy)
- Incremental Approach (lengthy)

1.Total Approach

Statement for evaluation of Credit Policy

Particulars	Present 30 days	Proposal (I) 60 days	Proposal (II) 90 days
Credit Sales Less Variable Cost Less Fixed Cost Less Bad Debt Less Collection Cost Less **Discount (Cash)**			
Estimated PBT **- Tax (if given)**			
(A) Estimated Profit (PAT)			
(B) Opportunity cost of investment in Debtors (Int on Debtors Cost)			
Net Benefit (A - B)			

Advice: Select highest Net Benefit Option.

Note :

1.(B) Int on Debtors Cost =**(VC +FC)Cost of Sales** × $\frac{ACP}{12/52/365}$ × $Int\ Rate$

2. If FC is not given, we can calculate Interest only on VC.

3. If Tax rate is **given**
   - ➔ Profit should be Profit after Tax
   - ➔ Int rate should be after Tax [I(1-t)]

If Tax rate is **missing**

➔ Profit should be before Tax
➔ Int rate should be before Tax rate.

2.Incremental Approach.

Ex:	Present Policy A**(30 days)**	Proposal (I) Policy (B)**(60 days)**	Proposal (II) Policy (c)**(90 days)**
Total Amount	(A)	(B)	(C)
Incremental Amount	-	(B - A)	(C - A)

(We will have to calculate incremental value for each item.)

Statement for evaluation of Credit policy

Particulars	Proposal (I)	Proposal (II)
Incremental Sales	(B) - (A)	(C) - (A)
Less: Incremental VC		
Less: Incremental FC		
Less: Incremental Bad Debt		
Less: Incremental Collection Cost		
Less: Incremental Cash Discount		
Incremental Expected Profits	*	*
- Tax	-	-
(A) Incremental Expected Profits		
(B) Incremental Int Cost on Debtors Cost	(-)	(-)
Net Benefit (A) - (B)	*	*

Extra Note : 2/15 net 45
If customer pays within 15 days he gets 2% discount else , he has to pay in 45 days.

Topic 4. Treasury & Cash Management

Concept . Cash Budget

1. It is a statement for cash projections (future)
2. It has estimated figures.
3. It shows transactions of both revenue and capital nature.
4. If we receive cash or pay cash it should be recorded in cash budget, even if it belongs to any specific period.
5. If we have to maintain a closing cash fixed figure. (EX: ₹20,000)
   ➔ **Any excess cash will be invested in short term securities.**
   ➔ **Deficit (a) Sell short term securities.**
   (b) Borrow short term funds.
6. Depreciation / Amortization will be ignored. (as it is non cash)

Cash Budget

Particulars	Jan	Feb	March
Opening Balance	xxx	20,000	20,000
Receipts			
• Cash sales	xxx	xxx	xxx
• Collection from debtors	xxx	xxx	xxx
• Sale of asset	xxx		
• Issue of share / Debenture	xxx		
• Income Tax refund	xxx		
• Miscellaneous receipts		xxx	xxx
Total Cash Available (A)			
Payments			
• Cash Purchases			
• Payment to Creditors			
• Purchase of Asset			
• Redemption of Debentures			
• Dividend paid			

• Income Tax Paid • Miscellaneous Payment			
Total Payments (B)			
Closing Cash (A) - (B)	28,000	15,000	13,000
Less: Investment in short term securities	- 8,000	+ 5,000	+ 3,000
Add : Sell short term securities			+ 4,000
Add : Short term borrowing			
Net Closing Cash	20,000	20,000	20,000

Topic 5. Management of Payables

1. **Cost of lost Cash Discount** = $\left(\frac{100}{100-d}\right)^{\frac{365}{t}} - 1$

   d= Discount amount (calculated on 100%)

   t = Reduction in time period (kitne din jaldi paise dene se discount mil sakta hai)

2. **Nominal Cost (on annual basis)**

   Rate = $\left(\frac{d}{100-d}\right) \times \frac{365}{t}$

Topic 6: Financing of WC

Concept 1: Factoring

Factor

➔ May collect amount from debtors
➔ May perform invoicing for client
➔ Non recourse factors bear bad debt losses also.

Factor	
Recourse	**Non Recourse**
• Factor will not bear bad debt.	• Factor will bear bad debt.

WORKING NOTE (i)

Debtors = Credit Sales (A) × ACP /365 or 12 or 52 = xxx(B)

Less Commission = (B) × $\frac{Rate}{100}$ = (-) (C)

Less Reserves = (B) × **Reserves %** = (-) (D)

Amount available for Advance = E = (B-C-D)

Less Interest on advance = (E)× $\frac{Rate}{100} \times \frac{n}{12}$ = (-) (F)

Net Advance Amount = (G)

Statement for evaluation of factoring Proposal.

Particulars	Amount(₹)
Benefits Saving in collection cost (Admin Cost) Saving in Bad debt (in case of non recourse factoring) Interest saved on reduced ACP **Cost of Sales**× $\frac{(Old\ ACP - New\ ACP)}{365\ or\ 360} \times Rate\ of\ Interest$	
Total Benefits	
Costs Commission (Annual) = (C) × $\frac{12\ or\ 52\ or\ 365}{ACP}$ Interest (Annual) = (F) × $\frac{12/52/365}{ACP}$	
Total Cost	

Net Benefit (X) - (Y) or Net Cost (Y) - (X)

X > Y **If Y > X**

Decision Making :

Case 1: If we have Net Benefit (X - Y)(+) : Accept Factoring

Case 2: If we have Net Cost (Y - X), then **calculate effective Interest on advance**(effective factoring rate)

Effective Rate = $\frac{Net\ Cost\ of\ factoring}{Net\ Advance\ Amount}$ or $\frac{Net\ Cost\ of\ Factoring}{Amount\ available\ for\ Advance}$

= $\frac{Y-X}{(G)}$ or $\frac{Y-X}{(F)}$

= x %

If X% > Market Int Rate, **Reject Factoring**

If X% < Market Int Rate, **Accept Factoring**

Question 58 :(MTP October 2023)

The following information is provided by the Shrishti Ltd. for the year ending 31st March 2022.

Raw Material storage period	54 days
Work in progress conversion period	20 days
Finished Goods storage period	22 days
Debt Collection period	74 days
Creditors' payment period	25 days
Annual Operating Cost	45 crore

(Including depreciation of ₹42,00,000) (1 year = 360 days)

You are required to CALCULATE Operating Cycle period and Number of Operating Cycles in a year.

Solution 58 :

Calculation of Operating Cycle Period and number of Operating Cycle in a Year

Operating Cycle Period = R + W + F + D – C

= 54 + 20 + 22 + 74 – 25 = 145 days

Number of Operating Cycle in a Year = $\frac{360}{Operating\ Cycle\ Period}$

= 360/145 = 2.48 times

Question 59 :(September 2024)

The following information is available for SK Limited for the year ended on 31st March,2024:

Particulars	₹
Cost of production	15,48,000
Cost of goods sold	14,61,000
Average stock of work-in-progress	94,600
Average stock of finished goods	2,43,500
Administration and Selling expenses	4,14,000
Receivables collection period	36 days
Raw Material Storage period	65 days
Creditors payment period	63 days

You are required to calculate the working capital requirement by operating cycle method. Assume a 360 days year.

Solution 59 :

Operating Cycle = R + W + F + D – C

Where,

R = Raw material storage period = 65 days

W = Work-in-progress inventory* holding period

F = Finished goods storage period

D = Receivables (Debtors) collection period = 36 days

C = Credit period allowed by suppliers (Creditors) = 63 days

Work-in-progress inventory holding period (W)

$= \frac{Average\ Work-in-progress\ inventory}{Average\ Cost\ of\ Production\ per\ day} = \frac{₹\ 94,600}{₹15,\ 48,000 \div 360\ days}$ = = 22 days

Finished Goods storage period (F)

$= \frac{Average\ stock\ of\ finished\ goods}{Average\ Cost\ of\ Goods\ Sold\ Per\ day} = \frac{₹2,\ 43,500}{₹14,61,000 \div 360\ days}$ = 60 days

Net Operating Cycle = 65+22+60+36-63 = 120 days

Number of Operating Cycles in a year = $\frac{No.\ of\ days\ in\ a\ year}{Operating\ Cycle\ period} = \frac{360\ days}{120\ days}$ = 3 times

Amount of Working Capital Required = $\frac{Annual\ Operating\ Cost}{Number\ of\ Operating\ Cycles} = \frac{₹\ 14,61,000 + ₹\ 4,14,000}{3}$ = =₹ 6,25,000

Question 60 : (MTP October 2023)

Cost sheet of X&Y Ltd. provides the following particulars:

	Amount per unit (₹)
Raw materials cost	260.00
Direct labour cost	125.00
Overheads cost	200.00
Total cost	585.00
Profit	75.00
Selling Price	660.00

The Company keeps raw material in stock, on an average for four weeks; work-in-progress, on an average for one week; and finished goods in stock, on an average for two weeks.
The credit allowed by suppliers is three weeks and company allow four weeks credit to its debtors. The lag in payment of wages is one week and lag in payment of overhead expenses is two weeks.
The Company sells one-fifth of the output against cash and maintains cash-in-hand and at bank put together at ₹ 2,70,000.
Required:
PREPARE a statement showing estimate of Working Capital needed to finance an activity level of 2,40,000 units of production. Assume that production is carried on evenly throughout the year, and wages and overheads accrue similarly. Work-in-progress stock is 75% complete in all respects.

Solution 60 :

Statement showing Estimate of Working Capital Needs

	(Amount in ₹)	(Amount in ₹)
A. Current Assets		
(i) Inventories:		
Raw material (4 weeks) $\left(\frac{2,40,000\ units \times ₹260}{52\ weeks} \times 4\ weeks\right)$	48,00,000	
WIP Inventory (1 week) $\left(\frac{2,40,000\ units \times ₹585}{52\ weeks} \times 1\ week\right) \times 0.75$	20,25,000	
Finished goods inventory (2 weeks) $\left(\frac{2,40,000\ units \times ₹585}{52\ weeks} \times 2\ weeks\right)$	54,00,000	1,22,25,000
(ii) Receivables (Debtors) (4 weeks) $\left(\frac{2,40,000\ units \times ₹585}{52\ weeks} \times 4\ weeks\right) \times \frac{4}{5}$		86,40,000
(iii) Cash and bank balance		2,70,000
Total Current Assets		2,11,35,000
B. Current Liabilities:		
(i) Payables (Creditors) for materials (3 weeks) $\left(\frac{2,40,000\ units \times ₹260}{52\ weeks} \times 3\ weeks\right)$		36,00,000
(ii) Outstanding wages (1 week) $\left(\frac{2,40,000\ units \times ₹125}{52\ weeks} \times 1\ week\right)$		5,76,923
(iii) Outstanding overheads (2 weeks) $\left(\frac{2,40,000\ units \times ₹200}{52\ weeks} \times 2\ weeks\right)$		18,46,154
Total Current Liabilities		60,23,077
Net Working Capital Needs (A – B)		**1,51,11,923**

Question 61 : (Nov 2023)

X Ltd. has furnished following cost sheet of per unit cost;

Raw material cost	₹ 150
Direct labour cost	₹ 40
Overhead cost	₹ 60
Total Cost	₹ 250
Profit	₹ 50
Selling Price	₹ 300

The company keeps raw material in stock on an average for 2 months; work in progress on an average for 3 months and finished goods in stock on an average 1 month. The credit allowed by suppliers is 1.5 months and

company allows 2 months credit to its debtors. The lag in payment of wages is 1 month and lag in payment of overhead expenses is 1.5 months. The company sells 25% of the output against cash and maintain cash in hand at bank put together at ₹ 1,50,000. Production is carried on evenly throughout the year and wages and overheads also similarly. Work in progress stock is 75% complete in all respects. Prepare statement showing estimate of working capital requirements to finance an activity level of 15,000 units of production.

Solution 61 :

Statement showing Estimate of Working Capital Needs

(Receivables (Debtors) are calculated based on Cost of goods sold)

		(₹)	(₹)
A.	**Current Assets**		
(i)	Inventories:		
	Raw material (2 months) $\left(\frac{15,000\ units \times ₹150}{12\ months} \times 2\ months\right)$	3,75,000	
	WIP Inventory (3 months) $\left(\frac{15,000\ units \times ₹250}{12\ months} \times 3\ months\right) \times 0.75$	7,03,125	
	Finished goods inventory (1 months) $\left(\frac{15,000\ units \times ₹250}{12\ months} \times 1\ month\right)$	3,12,500	13,90,625
(ii)	Receivables (Debtors) (2 months) $\left(\frac{15,000\ units \times ₹250}{12\ months} \times 2\ months\right) \times 0.75$		4,68,750
(iii)	Cash and bank balance		1,50,000
	Total Current Assets		20,09,375
B.	**Current Liabilities:**		
(i)	Payables (Creditors) for materials (1.5 months) $\left(\frac{15,000\ units \times ₹150}{12\ months} \times 1.5\ months\right)$		2,81,250
(ii)	Outstanding wages (1 months) $\left(\frac{15,000\ units \times ₹60}{12\ months} \times 1\ month\right)$		50,000
(iii)	Outstanding overheads (1.5 months) $\left(\frac{15,000\ units \times ₹60}{12\ months} \times 1.5\ months\right)$		1,12,500
	Total Current Liabilities		4,43,750
	Net Working Capital Needs (A – B)		15,65,625

Alternative Solution

Statement showing Estimate of Working Capital Needs

(Receivables (Debtors) are calculated based on Selling price)

		(₹)	(₹)
A.	**Current Assets**		
(i)	Inventories:		
	Raw material (2 months) $\left(\frac{15,000\ units \times ₹150}{12\ months} \times 2\ months\right)$	3,75,000	
	WIP Inventory (3 months) $\left(\frac{15,000\ units \times ₹250}{12\ months} \times 3\ months\right) \times 0.75$	7,03,125	
	Finished goods inventory (1 months) $\left(\frac{15,000\ units \times ₹250}{12\ months} \times 1\ month\right)$	3,12,500	13,90,625
(ii)	Receivables (Debtors)(2 months) $\left(\frac{15,000\ units \times ₹300}{12\ months} \times 2\ months\right) \times 0.75$		5,62,500
(iii)	Cash and bank balance		1,50,000
	Total Current Assets		21,03,125
B.	**Current Liabilities:**		

(i)	Payables (Creditors) for materials (1.5 months) $\left(\frac{15,000\ units \times ₹150}{12\ months} \times 1.5\ months\right)$		2,81,250
(ii)	Outstanding wages (1 months) $\left(\frac{15,000\ units \times ₹40}{12\ months} \times 1\ month\right)$		50,000
(iii)	Outstanding overheads (1.5 months) $\left(\frac{15,000\ units \times ₹60}{12\ months} \times 1.5\ months\right)$		1,12,500
	Total Current Liabilities		4,43,750
	Net Working Capital Needs (A – B)		16,59,375

Question 62 :(RTP Sept 2024)

TMT Limited is commencing a new project for manufacture of electric toys. The following cost information has been ascertained for annual production of 60,000 units at full capacity:

		Amount per unit (₹)
Raw materials		20
Direct labour		15
Manufacturing overheads:		
	₹	
Variable	15	
Fixed	10	25
Selling and Distribution overheads:		
	₹	
Variable	3	
Fixed	1	4
Total cost		64
Profit		16
Selling price		80

In the first year of operations expected production and sales are 40,000 units and 35,000 units respectively. To assess the need of working capital, the following additional information is available:

(i) Stock of Raw materials 3 months consumption.
(ii) Credit allowable for debtors 1½ months.
(iii) Credit allowable by creditors 4 months.
(iv) Lag in payment of wages 1 month.
(v) Lag in payment of overheads ½ month.
(vi) Cash in hand and Bank is expected to be ₹ 60,000.
(vii) Provision for contingencies is required @ 10% of working capital requirement including that provision.

You are required to PREPARE a projected statement of working capital requirement for the first year of operations. Debtors are taken at cost.

Solution 62 :

Statement Showing Cost and Sales for the First Year

Annual Production Capacity	60,000 units
Production	40,000 units
Sales	35,000 units

Particulars	**₹**
Sales Revenue (₹ 80 ´ 35,000)	28,00,000
Cost of Production:	
Materials @ ₹ 20 per unit	8,00,000
Direct Labour @ ₹ 15 per unit	6,00,000
Manufacturing Overheads	
Variable @ ₹ 15 per unit	6,00,000
Fixed (based on production capacity 60,000 units x₹ 10)	6,00,000
Cost of Production	26,00,000
Less: Closing Stock (40,000 – 35,000 = 5,000 units)	

(₹ $\frac{26,00,000}{40,000}$ × 5,000 units)	3,25,000
Cost of Goods Sold	22,75,000
Add: Selling & Distribution Overheads	
Variable @ ₹ 3 ´ 35,000 units = 1,05,000	
Fixed (Re. 1 ´ 60,000 units) = 60,000	1,65,000
Cost of Sales	24,40,000
Profit	3,60,000

Statement Showing Working Capital Requirement

A.	**Current Assets**		**₹**
	Stock of Raw Materials	(₹ 8,00,000 x 3/12)	2,00,000
	Stock of Finished Goods		3,25,000
	Debtors at Cost	(₹ 24,40,000 x 3/24)	3,05,000
	Cash and Bank		60,000
	Total (A)		8,90,000
B.	**Current Liabilities**		
	Creditors for Materials	(₹ 10,00,000 x 4/12)	3,33,333
	Creditors for Expenses	(₹ 13,65,000 x 1/24)	56,875
	Outstanding Wages	(₹ 6,00,000 x 1/12)	50,000
	Total (B)		4,40,208
	Working Capital Requirement before Contingencies **(A – B)**		4,49,792
	Add: Provision for Contingencies (₹ 4,49,792 x 1/9)		49,977
	Estimated Working Capital Requirement		4,99,769

Workings Notes:

Purchase of Raw Material during the first year	₹
Raw Material consumed during the year	8,00,000
Add:Closing Stock of Raw Materials(3months consumption)	2,00,000
	10,00,000
Less: Opening Stock of Raw Material	Nil
Purchases during the year	10,00,000

Question 63: (RTP May 2025)

The management of Parshvam Limited is planning to expand its business at international level and consults you for preparing and estimation of working capital needs so that they can avail the finance from the bank. The estimated data of Parshvam Limited reveal the following information –

Particulars	Amount (₹)
Materials Used	9,00,000
Domestic on 2 months credit Imports on 3 months credit **	6,00,000
Lag in Payment of wages - 1 month	6,00,000
Lag in Payment of Manufacturing Overheads – ½ Month	26,40,000
Sales	
Domestic on 1.5 months credit	30,00,000
Export on 3 months credit (sale price 10% below domestic price)	24,80,000
Administrative expenses payable in advance for 2 months	3,60,000
Lag in payment of Selling & Distribution expenses – 1 month	3,00,000

Advance Income tax for ₹25,000 for the quarter falling in the next financial year is paid by the company. Manufacturing overheads is inclusive of depreciation on the new machine purchased for tailor-made export products. The purchase price for the new machine is ₹24,00,000 with a depreciation rate of 10%. Cash Gross profit is at 20% on domestic sales.

However, to promote exports, Export Promotion Council (EPC Board) provides a revenue subsidy of 2.5% for the new machine purchased. Furthermore, Parshvam Limited submits the letter of credit (LOC) to its bank and avails the all-Export Sales value within 1 month. Financial institution charges a fee of 5% for the same.

The company keeps one month stock of raw materials and finished goods each. Goods remain in process for half a month with 90% raw materials introduced in the process. The company believes in keeping cash and bank balance of ₹1,50,000. The management is of the opinion that the safety margin is to be kept at 15%.

**Raw materials imported will attract a custom duty at 20% to be paid up front with a duty drawback of 5% credited upfront. You are required to -
(A) PREPARE the estimated working capital statement for the next year.
(B) ADVISE whether Parshvam Limited should continue with the export business or not.
(Requisite assumptions and notes should form part of the solution).

Solution 63.

(A) Statement for estimation of Working Capital using Cash Cost Basis

Parshvam Limited

Particulars		**Amount (₹)**	**Amount (₹)**
(A) Current Assets			
1.	Raw materials 15,90,000 x 1/12	1,32,500	
2.	WIP		
	~ RM 15,90,000 x 0.5 /12 x 90%	59,625	
	~ Wages 6,00,000 x 0.5 /12 x 50%	12,500	
	~ Manufacturing OH 23,40,000 x 0.5 /12 x 50%	48,750	
	~ Other OH 74,472 x 0.5 /12 x 50%	1,552	
3.	FG (on COGS) 46,04,472 x 1/12	3,83,706	
4.	Debtors		
	~ Domestic 27,61,314 x 1.5/12	3,45,164	
	~ Export 26,27,158 X 1/12 **WN - 5**	2,18,930	
5.	Cash/bank balance (given)	1,50,000	
6.	Prepaid admin exp 3,60,000 x 2/12	60,000	
7.	Income tax paid in advance (given)	25,000	
Gross working capital			**14,37,727**
(B) Current Liabilities			
1.	Creditors		
	~ Domestic 9,00,000 x 2/12	1,50,000	
	~ Import 6,00,000 x 3/12	1,50,000	
2.	Lag in wages payment 6,00,000 x 1/12	50,000	
3.	Lag in manufacturing OH 23,40,000 x 0.5/12	97,500	
	Lag in other OH 74,472 x 0.5/12	3,103	
4.	Lag in S&D exp 3,00,000 x 1/12	25,000	
Excess of CA over CL			**9,62,124**
Add: 15% safety margin (9,87,124 x 15%)			**1,44,319**
Net working capital			**11,06,443**

Notes –
(a) Working Capital is estimated on Cash Cost Basis
(b) Other Overheads are assumed to be the part of production.
(c) In absence of information on % completion for wages, manufacturing and other overheads, it is assumed to be 50% complete for the purpose of calculating WIP.
(d) Other Overheads are also assumed to be outstanding for a period of ½ month. In absence of specific information, it can also be assumed that nothing is outstanding or prepaid.

(B)
If just the monetary aspects and factors are considered then, Parshvam limited should discontinue its operations at international level as the Cash Cost of sales for export at ₹ 26,27,158 is higher than the Export sales value which is just ₹ 24,80,000. In reality, non-monetary factors are also considered in decision making; exports will add a new customer base for the company. Furthermore, existence at international level brings on a high credibility and image to the company, etc.

WN 1 - Calculation of gross profit on Export Sales:
Let the domestic selling price be ₹100.
Therefore, Gross profit = ₹20, and cost per unit = ₹ 80

Now as given, Export price is 10% less than the domestic price = 100 – 10% = ₹ 90. However, the cost per unit to produce exported goods will remain at ₹ 80 only.
So gross profit on exports will be ₹ 90 - 80 = ₹ 10.
Therefore, Gross profit in % for Export Sales = 10 / 90 = 11.11%

	Domestic	Export	Total
Sales	30,00,000	24,80,000	54,80,000
Less: Gross Profit 20% for Domestic 11.11% for Export	(6,00,000)	(2,75,528)	(8,75,528)
COGS	24,00,000	22,04,472	46,04,472
Add: Admin Exp (To be Apportioned in the ratio of Sales)	1,97,080	1,62,920	3,60,000
Add: S&D Expense (To be Apportioned in the ratio of Sales)	1,64,234	1,35,766	3,00,000
Add: Bank Fees and charges for providing LOC services	-	1,24,000	1,24,000
Cash Cost of Sales	**27,61,314**	**26,27,158**	**53,88,472**

WN 2 - Preparation of Cost/Income Statement

Particulars	**Amount (₹)**
Raw Materials	
Domestic	9,00,000
Import **WN - 3**	6,90,000
Wages	6,00,000
Manufacturing Overheads (Cash) **WN - 4**	23,40,000
Other Overheads (Bal. Fig)	74,472
Cost of Production/Cost of Goods Sold	**46,04,472**
Add: Admin Exp	3,60,000
Add: S&D Exp	3,00,000
Add: Bank charges & Fees for L.O.C services	1,24,000
Cost of Sales	**53,88,472**

WN 3 – Calculation of Raw Materials Purchased - Imports

Purchase Price = ₹ 6,00,000
+ Custom Duty @ 20% = ₹ 1,20,000
(-) Upfront Duty Drawback @ 5% = ₹ (30,000)
Total Value of Raw materials = ₹ 6,90,000

WN 4 – Calculation of Cash Manufacturing Overheads

Manufacturing Overheads = ₹ 26,40,000
Less: Depreciation on Machinery
(24,00,000 x 10%) = ₹ (2,40,000)
Less: Revenue Subsidy from EPC Board ***
(24,00,000 x 2.5%) = ₹ (60,000)
Cash Manufacturing Overheads = ₹ 23,40,000

***Revenue subsidy shall not be capitalized but instead it will result in bringing down your manufacturing expenses which is revenue in nature. Had the it been the capital subsidy, then it would have reduced the purchase price of the machine and thereby changing the amount of depreciation.

WN 5 - Credit Period for Export customers

Since the company is availing benefit of Letter of Credit (L.O.C), the funds blocked in export customers would only be for 1 month and not 3 months; as the company would receive the entire Export Sales value in 1 month's time from the financial institution after paying the bank charges and fees.

Question 64: (Jan 2025)

KP Ltd. has provided the following information:

(i) Estimated monthly sales:

Month	₹ in Lakh
April - 2024	10

May - 2024	12
June - 2024	15
July - 2024	10
August - 2024	13
September - 2024	14

(ii) Gross Profit Ratio is 20%.
(iii) Cost of Goods sold is paid in next month.
(iv) Sales are in credit and credit period is allowed for 2 months.
(v) Indirect Expenses are paid in the same month.
Monthly indirect expenses are as follows:

Month	₹ in Lakh
June - 2024	1.0
July - 2024	1.2
August - 2024	1.0
September - 2024	1.3

(vi) Dividend amounting ₹3 Lakh will be paid in the month of September 2024.
(vii) Cash Balance on 01/07/2024 was ₹1.5 lakh.
(viii) The company has to maintain minimum cash balance of ₹1 Lakh. If there is cash cash deficit in any month, company would take a temporary short term loan and if cash balance exceed ₹2 lakh , then company would invest for short term excess amount of ₹2 Lakh.
(ix) Ignore the interest on short term loans and short term investment.
You are required to prepare Cash Budget for three months starting from July 2024.

Question 65: Study Material

From the information and the assumption that the cash balance in hand on 1st January 2010 is ₹ 72,500 prepare a cash budget. Assume that 50 per cent of total sales are cash sales. Assets are to be acquired in the months of February and April. Therefore, provisions should be made for the payment of ₹ 8,000 and ₹ 25,000 for the same. An application has been made to the bank for the grant of a loan of ₹ 30,000 and it is hoped that loan amount will be received in the month of May.
It is anticipated that a dividend of ₹ 35,000 will be paid in June. Debtors are allowed one month's credit. Creditors for materials purchased and overheads grant one month's credit. Sales commission at 3 per cent on sales is paid to the salesman each month.

Months	Sales (₹)	Material Purchases (₹)	Salaries & Wages (₹)	Production Overheads (₹)	Office & Selling Overheads (₹)
January	72,000	25,000	10,000	6,000	5,500
February	97,000	31,000	12,100	6,300	6,700
March	86,000	25,500	10,600	6,000	7,500
April	88,600	30,600	25,000	6,500	8,900
May	1,02,500	37,000	22,000	8,000	11,000
June	1,08,700	38,800	23,000	8,200	11,500

Solution 65:

Cash Budget

Particulars	Jan (₹)	Feb (₹)	March (₹)	April (₹)	May (₹)	June (₹)	Total (₹)
Receipts:							
Cash sales	36,000	48,500	43,000	44,300	51,250	54,350	2,77,400
Collections from debtors	-	36,000	48,500	43,000	44,300	51,250	2,23,050
Bank loan	-	-	-	-	30,000		30,000
Total Receipts (A)	**36,000**	**84,500**	**91,500**	**87,300**	**1,25,550**	**1,05,600**	**5,30,450**
Payments:							
Materials	-	25,000	31,000	25,500	30,600	37,000	1,49,100
Salaries and wages	10,000	12,100	10,600	25,000	22,000	23,000	1,02,700
Production overheads	-	6,000	6,300	6,000	6,500	8,000	32,800

Office & selling overheads	-	5,500	6,700	7,500	8,900	11,000	39,600
Sales Commission	2,160	2,910	2,580	2,658	3,075	3,261	16,644
Capital expenditure	-	8,000	-	25,000	-	-	33,000
Dividend	-	-	-	-	-	35,000	35,000
Total Payments (B)	**12,160**	**59,510**	**57,180**	**91,658**	**71,075**	**1,17,261**	**4,08,844**
New cash flow (A) – (B)	23,840	24,990	34,320	(4,358)	54,475	(11,661)	1,21,606
Balance at the beginning of month	72,500	96,340	1,21,330	1,55,650	1,51,292	2,05,767	1,94,106
Balance at the end of month	**96,340**	**1,21,330**	**1,55,650**	**1,51,292**	**2,05,767**	**1,94,106**	**3,15,712**

Question 66 :(RTP Nov 2023)

A regular customer of your company has approached to you for extension of credit facility for purchasing of goods. On analysis of past performance and on the basis of information supplied, the following pattern of payment schedule emerges:

Pattern of Payment Schedule	
At the end of 30 days	20% of the bill
At the end of 60 days	30% of the bill.
At the end of 90 days	30% of the bill
At the end of 100 days	18% of the bill
Non-recovery	2% of the bill

The customer wants to enter into a firm commitment for purchase of goods of ₹ 40 lakhs in 2022, deliveries to be made in equal quantities on the first day of each quarter in the calendar year. The price per unit of commodity is ₹ 400 on which a profit of ₹ 20 per unit is expected to be made. It is anticipated that taking up of this contract would mean an extra recurring expenditure of ₹ 20,000 per annum. If the opportunity cost is 18% per annum, would you as the finance manager of the company RECOMMEND the grant of credit to the customer? Assume 1 year = 360 days.

Solution 66 :

Statement showing the Evaluation of credit Policies

Particulars			**Proposed Policy ₹**
A.	Expected Profit:		
	(a)	Credit Sales	**40,00,000**
	(b)	Total Cost	
		(i) Variable Costs (₹ 380 x 10000 units)	38,00,000
		(ii) Recurring Costs	20,000
			38,20,000
	(c)	Bad Debts	**80,000**
	(d)	Expected Profit [(a) – (b) – (c)]	**1,00,000**
B.	Opportunity Cost of Investments in Receivables		**1,31,790**
C.	Net Benefits (A – B)		**(31,790)**

Recommendation: The Proposed Policy should not be adopted since the net benefits under this policy are negative.

Working Note: Calculation of Opportunity Cost of Average Investments

Opportunity Cost = Total Cost × $\frac{Collection\ period}{360}$ × $\frac{Rate\ of\ Return}{100}$

Particulars		**20%**	**30%**	**30%**	**18%**	**Total**
A.	Total Cost	7,64,000	11,46,000	11,46,000	6,87,600	**37,43,600**
B.	Collection period	30/360	60/360	90/360	100/360	
C.	Required Rate of Return	18%	18%	18%	18%	
D.	OpportunityCost (A x B x C)	11,460	34,380	51,570	34,380	**1,31,790**

Question 67 : Pyq

The following details are available in respect of a firm:

- Annual requirement of inventory 40,000 units
- Cost per unit (other than carrying and ordering cost) ₹ 16
- Carrying cost are likely to be 15% per year
- Cost of placing order ₹ 480 per order

Determine the economic ordering quantity.

Solution 67:

Carrying cost per annum = Cost per unit × Carrying cost % p.a.
= ₹ 16 × 0.15 = ₹ 2.40

$$EOQ = \sqrt{\frac{2 \times Annual\ consumption\ p.a. \times Ordering\ cost\ per\ order}{Carrying\ Cost\ per\ unit}}$$

$$= \sqrt{\frac{2 \times 40{,}000 \times 480}{2.40}} = 4{,}000 \text{ units}$$

Question 68: Pyq

The demand for a certain product is random. It has been estimated that the monthly demand of the product has a normal distribution with a mean of 390 units. The unit price of product is ₹ 25. Ordering cost is ₹ 40 per order and inventory carrying cost is estimated to be 35 per cent per year. Calculate Economic Order Quantity (EOQ).

Solution 68:

A = 390 units × 12 = 4,680 units
O = ₹ 40
C = 35% × ₹ 25 = ₹ 8.75

$$EOQ = \sqrt{\frac{2 \times A \times O}{C}}$$

$$= \sqrt{\frac{2 \times 4{,}680 \times 40}{8.75}} = 206.85 \text{ units}$$

Question 69;

XYZ Limited normally pays its Suppliers in the third month after invoicing. It is now offered a 2% discount for payment within one month on invoicing. Payments are at ₹ 3,00,000 per month, and the Company operates on Bank Overdraft on which interest is charged at 14.5%. Advise whether the offer should be accepted.
Would your answer differ if the Company were given 3% discount, all other conditions remaining the same as above?

Solution 69:

(a) When Discount = 2%

Particulars	Amount (₹)
Benefit = Discount Received [₹ 3,00,000 × 2%]	6,000
Cost = Opportunity Cost of funds due to early payment [₹ 3,00,000 × 14.5% × $\frac{2}{12}$] (Payment being made two months in advance, i.e. 3rd month Vs 1st month)	7,250
Net Benefit/ (Cost) per month	(1,250)

Net Payment to Supplier will be ₹ 3,00,000 less 2% discount = ₹ 2,94,000.
Interest can also be calculated on ₹ 2,94,000, being the actual outflow of cash.
So, Interest Cost = ₹ 2,94,000 × 14.5% × $\frac{2}{12}$ = ₹ 7,105

Conclusion: As there is a Net Cost of ₹ 1,250, the discount offer is not worthwhile. The Company may pay the Supplier in the third month after invoicing.

(b) **When Discount** = 3%, Benefit = Discount Received = ₹ 3,00,000 × 3% = ₹ 9,000.
Net Benefit = ₹ 9,000 – ₹ 7,250 = ₹ 1,750.
Conclusion: Since there is a Net Benefit, the 3% Discount Offer may be accepted and the payment can be made early.

Question 70: Study Material

A Factoring firm has credit sales of ₹ 360 lakhs and its average collection period is 30 days. The financial controller estimates, bad debt losses are around 2% of credit sales. The firm spends ₹ 1,40,000 annually on debtors administration. This cost comprises of telephonic and fax bills along with salaries of staff members. These are the avoidable costs. A Factoring firm has offered to buy the firm's receivables. The factor will charge 1% commission and will pay an advance against receivables on an interest @15% p.a. after withholding 10% as reserve. ANALYSE what should the firm do? Assume 360 days in a year.

Question 71: Rtp

Jaidev Ltd has total credit sales of ₹ 40 lakhs p.a. and its average collection period is 90 days. The past experience indicates that the Bad Debt losses are around 3% of credit sales. Jaidev spends about ₹ 1,00,000 per annum on administrating its credit sales. It is considering availing the services of a Factoring Firm. It has received offer from Uday Ltd, which agrees to buy the receivables of Company. Uday will charge Commission of 3% and also agrees to pay advance against receivables at an Interest Rate of 18% p.a. after withholding 10% as Reserve. Should Jaidev accept Uday's offer if the former's ROI is 15%? Assume 360 days in a year.

Question 72: (May 2024)

Following is the sales information in respect of Bright Ltd:

Annual Sales (90% on credit)	₹7,50,00,000
Credit period	45 days
Average Collection period	70 days
Bad debts	0.75%
Credit administration cost (Out of which 2/5th is avoidable)	₹18,60,000

A factor firm has offered to manage the company's debtors on a non-recourse basis at a service charge of 2%. Factor agrees to grant advance against debtors at an interest rate of 14% after withholding 20% as reserve. Payment period guaranteed by factor is 45 days. The cost of capital of the company is 12.5%. One time redundancy payment of ₹50,000 is required to be made to factor.

Calculate the effective cost of factoring to the company. (Assume 360 days in a year)

Solution 072 :

Evaluation of Factoring Proposal

	Particulars	**₹**	**₹**
A.	**Savings due to factoring**		
	Bad Debts saved	0.75% x 7.5 crores x 90%	₹ 5,06,250
	Administration cost saved	18.6 lakhs x 2/5	₹ 7,44,000
	Interest saved due to reduction in average collection period	7.5 crores x 90% x (70-45)/ 360 x 12.5%	₹ 5,85,937.5
	Total		**₹ 18,36,187.5**
B.	**Costs of factoring:**		
	Service charge	7.5 crores x 90% x 2%	₹ 13,50,000
	Interest cost	₹ 1,15,171.875 x 360/45	₹ 9,21,375
	Redundancy Payment		₹ 50,000
	Total		**₹ 23.21,375**
C.	**Net Annual cost to the Firm: (A-B)**		**₹ 4,85,187.5**
	Rate of effective cost of factoring	₹ 4,85,187.5/ ₹ 64,66,078.125 x 100	**7.504%**

Advice: Since the rate of effective cost of factoring is less than the existing cost of capital, therefore, the proposal is acceptable.

Credit Sales = ₹ 7.5 crores x 90%	= ₹ 6,75,00,000
Average level of receivables = ₹ 6.75 crores x 45/360	= ₹ 84,37,500
Service charge = 2% of ₹ 84,37,500	₹ 1,68,750
Reserve = 20% of ₹ 84,37,500	₹ 16,87,500
Total (i)	₹ 18,56,250
Thus, the amount available for advance is	
Average level of receivables	₹ 84,37,500
Less: Total (i) from above	₹ 18,56,250

Credit Sales = ₹ 7.5 crores x 90%	= ₹ 6,75,00,000
(ii)	₹ 65,81,250
Less: Interest @ 14% p.a. for 45 days	₹ 1,15,171.875
Net Amount of Advance available.	₹ 64,66,078.125

Note: Alternatively, if redundancy cost is taken as irrelevant for decision making, then Net Annual cost to the Firm will be ₹ 4,35,187.5 and Rate of effective cost of factoring will be ₹ 4,35,187.5/₹ 64,66,078.125 x 100 = 6.730%

If average level of receivables is considered for 70 days then the calculation can be done in following way:

Evaluation of Factoring Proposal

Credit Sales = ₹ 7.5 crores X 90%	= ₹ 6,75,00,000
Average level of receivables = ₹ 6.75 crores x 70/360	= ₹ 1,31,25,000
Service charge = 2% of ₹ 1,31,25,000	₹ 2,62,500
Reserve = 20% of ₹ 1,31,25,000	₹ 26,25,000
Total (i)	₹ 28,87,500
Thus, the amount available for advance is	
Average level of receivables	₹ 1,31,25,000
Less: Total (i) from above	₹ 28,87,500
(ii)	₹ 1,02,37,500
Less: Interest @ 14% p.a. for 45 days	₹ 1,79,156.25
Net Amount of Advance available.	₹ 1,00,58,343.75

Note 1: Accordingly, interest cost will be ₹ 14,33,250 cost of factoring will be ₹ 28,33,250. Therefore, Rate of effective cost of factoring is 9.913%

Note 2: Alternatively, if redundancy cost is taken as irrelevant for decision making, then Net Annual cost to the Firm will be ₹ 9,47,062.5 and Rate of effective cost of factoring will be ₹ 9,47,062.5/ ₹ 1,00,58,343.75 x 100 = 9.416%.

Advice: Since the rate of effective cost of factoring is less than the existing cost of capital, therefore, the proposal is acceptable.

Question 73: (RTP Jan 2025)

Nirmoh Limited wants to avail short-term loans from the bank. However, banks grant short term loans by keeping the collateral in the form of accounts receivable. A bank is analyzing the receivables of Nirmoh Limited to identify acceptable collateral for a short-term loan.

The current policy of the company is 3/10 net 40. Bank will lend only to the extent of 90% of acceptable receivables at an interest rate of 12% only if both the conditions mentioned below are fulfilled. Bank will keep a reserve of 5% for cash discount & returns

(a) Customers are not currently overdue for more than 5 days to the net period

(b) Average aging (payment period) of the customer should not exceed 15 days past the net period.

If any of the above conditions are not fulfilled, the bank will lend 65% of the receivables subject to a reserve of 15% and the interest rate will be charged at 15% on such accounts. The corporate tax rate applicable is 25%.

On the scrutiny of all the receivables, following are the acceptable receivables considered for lending-

Accounts	Amount (₹)	Outstanding in Days since invoiced	Average Aging (payment period) in Days
DR 01	50,000	37	40
DR 02	25,000	25	48
DR 03	1,20,000	47	49
DR 04	72,000	10	56
DR 05	45,000	30	30
DR 06	1,75,000	39	50
DR 07	19,000	55	25
DR 08	54,000	44	54

DR 09	1,05,000	15	25
DR 10	37,000	22	75

You are required to CALCULATE:
(a) Total amount lend by the bank
(b) Effective Interest cost (%) to the company

Solution 73:

(A) Condition (a) says that accounts shouldn't be overdue for more than 5 days to the net period. In other words, it means those accounts who are overdue by 45 days (40 days + 5 additional days), will not fulfill condition a) and thus will not be eligible for 90% lending.

Therefore, from the above, we can see that **Accounts DR 03 & DR 07** are overdue for more than 45 days and hence will not be eligible for 90% lending.

Condition (b) says that average receivables ageing (payment period) should not exceed 15 days to the net period i.e. it should not exceed 55 days (40 days + 15 days = 55 days). Therefore, from the above, we can see that **Accounts DR 04 & DR 10** has an ageing of more than 55 days. Hence, they would also not be eligible for 90% lending.

Amount of Bank Lending:

Accounts	Bank Lending at 90%	Bank Lending at 65%
DR 01	50,000	-
DR 02	25,000	-
DR 03	-	1,20,000
DR 04	-	72,000
DR 05	45,000	-
DR 06	1,75,000	-
DR 07	-	19,000
DR 08	54,000	-
DR 09	1,05,000	-
DR 10	-	37,000
Total	**4,54,000**	**2,48,000**
(-) Reserve	22,700 {4,54,000 x 5%}	37,200 {2,48,000 x 15%}
Net	**4,31,300**	**2,10,800**
Loan	**3,88,170**	**1,37,020**

Total short-term loan granted by the bank = ₹ 5,25,190

(B) Calculation of the Effective Interest Cost

Interest at 12% (On 90% lending) = 3,88,170 x 0.12 = 46,580.4
Interest at 15% (On 65% lending) = 1,37,020 x 0.15 = 20,553
Total Interest = ₹ 67,133.4
Effective Interest Cost (%) = Interest (1-t) / Total Short-term Loan
= 67,133.4 (1-0.25) / 5,25,190
Effective Interest Cost (%) = 9.59%