

FINANCIAL RATIO ANALYSIS

A. LIQUIDITY RATIOS- SHORT TERM SOLVENCY

1. **Current ratio** =
$$\frac{\text{Current asstes}}{\text{Current liabilities}}$$
 - **Current assets**= inventories/ stock + cash & bank balance + Receivables + Accruals + Short term Loans + Marketable securities / short term securities .
 - **Current Liabilities**= sundry creditors + outstanding expenses + short term loans and Advances (cr) + bank overdraft /cash credit + provision for taxation + proposed dividend + unclaimed dividend .
 - **Significance** : *Ability to repay short- term liabilities Promptly*. Ideal ratio is 2:1
2. **Quick ratio/ Liquid ratio/ Acid test Ratio** =
$$\frac{\text{Quick asstes}}{\text{Quick Liabilities}}$$
 - **Quick asstes** = Current asstes – Inventories – stock
 - **Quick Liabilities** = Current Liabilities – Bank overdraft – cash credit
 - **Significance** : *ability to meet immediate liabilities* Ideal ratio is 1:1
3. **Absolute cash ratio / Absolute Liquidity ratio** =
$$\frac{\text{cash + Marketable securities}}{\text{Current liabilities}}$$
 - **Cash+marketable securities**= cash in hand + cash at bank (dr) + marketable investments/short term securities.
 - **Current Liabilities**= sundry creditors + outstanding expenses + short term loans and Advances (cr) + bank overdraft /cash credit + provision for taxation + proposed dividend + unclaimed dividend.
 - **Significance** : Availability of cash to meet short term commetments . No ideal ratio as such. If ratio is >1 It indicates very liquid resources,which are low in profitability.
4. **Basic defence interval Measure (in days)** =
$$\frac{\text{Quick asstes}}{\text{Cash expenses per day}}$$
 - **Quick asstes** = Current asstes – Inventories – stock
 - **Cash expenses per day** =
$$\frac{\text{Annual cash expenses}}{365}$$
 - **Cash expenses** = Total expenditure – depreciation and write offs.
 - **Significance** : *Ability to meet regular cash expenses*

NOTES : The first three ratios are expressed *in Times*, e.g. 1.33 times, 2.85 times etc. or *as a ratio* . i.e. 1.33:1 or 2.85 : 1 . The last ratio is expressed *in days*

B. CAPITAL STRUCTURE RATIOS - INDICATOR OF FINANCING TECHNIQUES & LONG TERM SOLVENCY

For capital structure ratios, The following terms are used with the respective meanings assigned 1

1. **Debt / Barrowed funds/Loan funds** = Debentures + Long term loans from bank , financial institutions, etc.
2. **Equity/net worth/shareholder's funds/Equity share capital + preference share capital + Proprietor's funds / owner's fund/ own Funds** = reserves and surplus – misc.expenses (as per b/s) and accumulated losses
3. **Equity share holders funds** = Equity as above – Preference share capital.
4. **Total funds /capital employed/Investment/** = Debt (1) + Equity (2)Liability route

Long term investment Fixed assets + net working capitalassets route

Fixed assets + working capital – long term debt

Base balance equation= Equity + debt = Fixed assets + net working capital (CA-CL)

Balance sheet

Liabilities			assets		
Equity share capital	}	equity	xxx	Fixed assets	xxx
Preference share capital			xxx	current assets	xxx
Reserves & surplus			xxx	fictitious assets	xxx
Long term debt	}	debt	xxx		
Current liabilities & provisions			xxx		
			-----		-----
Xxx			xxx		
			-----		-----

1. Debt to total funds ratio/debt ratio = $\frac{\text{Debt (as above 1)}}{\text{Total funds (as above 4)}}$

- **Significance** : Indicator of use of external funds, Ideal ratio is 67%

2. Equity to total funds ratio / equity ratio = $\frac{\text{Equity (as above 2)}}{\text{Total funds (as above 4)}}$

- **Significance**: indicates long term solvency, mode of financing and extent of own funds used in operations. ideal ratio is 33%

3. Debt - Equity ratio = $\frac{\text{Debt (as above 1)}}{\text{Equity (as above 2)}}$

- **Significance** : Indicates the relationship between debt & Equity Ideal ratio is 2:1

4. Capital gearing ratio = $\frac{\text{preference share capital + debt (as above 1)}}{\text{Equity share holders funds (as above 3)}}$

- **Significance**: shows the proportion of fixed charge (dividend or interest) bearing capital to equity funds, and the extent advantage or leverage enjoyed by equity share holders.

5. Proprietary ratio = $\frac{\text{proprietary funds (as above 2)}}{\text{Total assets}}$

- **Total assets** = net tangible fixed assets + total current assets
- **Significance**: Shows the proportion of total assets financed with debt and hence extent of financial leverage.

6. Debt to total assets = $\frac{\text{debt funds (as above 1)}}{\text{Total assets}}$

- **Total assets** = net tangible fixed assets + total current assets
- **Significance**: shows the proportion of total assets financed with debt and hence extent of financial leverage.

7. Fixed assets to long term fund ratio = $\frac{\text{net fixed assets i.e gross block}}{\text{Long term funds (as above 4)}}$

- **Significance** : shows the proportion of fixed assets (long term assets) financed by long term funds , indicates the financing approach followed by the firm i.e, constructive matching or aggressive Ideal ratio is less than one .

C. PROFITABILITY RATIOS BASED ON SALES

1. Gross profit ratio = $\frac{\text{gross profit}}{\text{Sales}}$

- Gross profit as per trading account
- Sales = sales – sales returns
- **Significance : indicator of basic profitability**

2. Operating profit ratio = $\frac{\text{operating profit}}{\text{Sales}}$

- **Operating profit** = sales – cost of sales (or)
Net profit as per p&l account (+)
Non-operating expenses (e.g. loss on sale of assets, preliminary expenses w/o, etc.) (+)
Non-operating incomes (e.g. rent, interest & dividend received)
- **Significance: indicator of operating performance of business.**

3. Net profit ratio = $\frac{\text{net profit}}{\text{Sales}}$

- **Net profit** = net profit as per p&l account (either before tax or after tax, depending upon data)
- **Significance: indicator of overall profitability.**

4. Contribution sales ratio / profit volume ratio = $\frac{\text{contribution}}{\text{Sales}}$

- **Contribution** = sales – variable costs.
- **Significance: indicator of profitability in marginal costing.**

5. Operating ratio / operating cost ratio = $\frac{\text{operating cost}}{\text{Sales}} = 100 - \text{operating profit ratio}$

- **Operating costs** = materials + labour + POH + AOH + depreciation.
- **All the above ratios are expressed in percentages. The higher the ratio, the better it is for the business.**

D. COVERAGE RATIOS - ability to serve fixed liabilities

1. Debt service coverage ratio = $\frac{\text{Earnings for debt service}}{\text{Interest + instalment}}$

- **Earnings for debt service** = net profit after taxation (+)
Interest on debt funds (+)
Non – cash operating expenses (i.e. Depreciation and amortizations (+)
Non – operating items / adjustments (i.e. loss on sale of FA)
- **Interest + instalment** = interest on debt + interest on loan principal
- **Significance: Indicates extent of current earnings available for meeting commitments of interest and instalment. Ideal ratio is 2 to 3 times.**

2. Interest coverage ratio = $\frac{\text{EBIT}}{\text{Interest}}$

- **EBIT** = earnings before interest and tax.
- **Interest** = interest on debt.
- **Significance: indicates ability to meet interest obligations of the current year. Should be greater than 1.**

3. Preference dividend coverage ratio = $\frac{\text{EAT}}{\text{Preference dividend}}$

- **Significance: indicates the ability to pay dividend on preference capital should be >1.**

E. TURNOVER /ACTIVITY/PERFORMANCE RATIOS

1. Raw material turnover ratio = $\frac{\text{cost of raw material consumed}}{\text{Avg stock of raw material}}$

- **Cost of raw material consumed** = opening stock of raw material (+)
Purchases of raw material (-)
Closing stock of raw material
- **Avg stock of raw material** = $\frac{\text{opening stock of RM stock} + \text{closing stock of RM stock}}{2}$
- **Significance:** indicates the how fast / regularly raw material used in production.

2. Work in process turnover ratio = $\frac{\text{factory cost}}{\text{Avg stock of WIP}}$

- **Factory cost** = material consumed + wages + POH
- **Avg stock of WIP** = $\frac{\text{opening stock of WIP stock} + \text{closing stock of WIP stock}}{2}$
- **Significance:** indicates the WIP movement / production cycle.

3. Finished goods or stock turnover ratio = $\frac{\text{cost of goods sold}}{\text{Avg stock of finished goods}}$

- **Cost of goods sold** = for manufactures: opening stock of FG + cost of production – closing stock of FG.
For traders: opening stock of FG + cost of goods purchased – closing stock of FG.
- **Avg stock of FG** = $\frac{\text{opening stock of FG stock} + \text{closing stock of FG stock}}{2}$
- **Significance:** indicates how fast inventory is used /sold. High t/o shows fast moving FG. Low t/o may mean dead or excessive stock.

4. Debtors turnover ratio = $\frac{\text{credit sales}}{\text{Avg accounts receivable}}$

- **Credit sales** = sales - cash sales
- **Avg accounts receivable** = $\frac{\text{opening debtors \& B/R} + \text{closing debtors \& B/R}}{2}$
- **Significance :** indicates the speed of collection of credit sales /debtors

5. Creditors turnover ratio = $\frac{\text{credit purchases}}{\text{Avg accounts payable}}$

- **Credit purchases** = purchases - cash purchases
- **Avg accounts receivable** = $\frac{\text{opening cars\& B/P} + \text{closing cars\& B/P}}{2}$
- **Significance:** indicates the speed /velocity of payment to creditors.

6. Working capital turnover ratio = $\frac{\text{turnover}}{\text{Net working capital}}$

- **Turnover/sales** = sales – sales returns
- **Net working capital** = CA- CL
Avg of opt and clog balances may be taken
- **Significance :** ability to generate sales per rupee for working capital

7. Fixed assets turnover ratio = $\frac{\text{turnover}}{\text{Net fixed assets}}$

- **Turnover/sales** = sales – sales returns
- Avg of opt and clg balances may be taken
- **Significance:** ability to generate sales per rupee of fixed assets.

• **8. capital turnover ratio = $\frac{\text{turnover}}{\text{Net fixed assets}}$**

Capital employed

- **Significance: ability to generate sales per rupee of long term investment.**

Notes:

- All the above T/o ratios are expressed in times .generally the higher the t/o ratio, the better it is.
- In respect of RM,WIP,FG stocks ,avg stock can also be calculated as $\frac{\text{max stock} + \text{min stock}}{2}$
- Working capital related t/o ratios, i.e., items 1 to 6 above can also expressed in terms of days as $\frac{365}{\text{T/O ratio}}$.

1. No of days avg stock of RM held $\frac{365}{\text{Raw material T/O ratio}}$
2. No of days avg stock of WIP held $\frac{365}{\text{WIP T/O ratio}}$
- 3.No of days avg stock of finished goods held /
No of days in sales in inventory /
Average stock velocity. $\frac{365}{\text{Finished goods T/O ratio}}$
- 4.Average collection period /
No of days of sales in receivable $\frac{365}{\text{Debtors T/O ratio}}$
- 5.Average payment period /
Average payment velocity $\frac{365}{\text{creditors T/O ratio}}$
- 6.No of days working capital held /
Operating cycle /cash cycle / WC cycle $\frac{365}{\text{Raw material T/O ratio}}$

F. OVERALL RETURN RATIOS – OWNER’S VIEW POINT

1. Return on investment (ROI) = pre-tax ROCE = $\frac{\text{EBIT}}{\text{equity} + \text{debt}}$

Or

Return on capital employed (ROCE) post tax ROCE = $\frac{\text{EAT} + \text{Interest}}{\text{Equity} + \text{debt}}$

- Either pre-tax or post tax ROCE may be prepared
- **Pre-tax ROCE** is generally preferred for analysis purposes
- **Significance: overall profitability of the business on the total funds employed.**

2. Return on equity (ROE) = pre-tax ROE = $\frac{\text{EBT}}{\text{equity}}$

Or

Return on net worth (ROCE) post tax ROE = $\frac{\text{EAT}}{\text{Equity}}$

- Either pre-tax or post tax ROE may be prepared
- **Pre-tax ROE** is generally preferred for analysis purposes
- **Significance: Indicates profitability of equity funds/ owner’s funds invested in the business**

3. Return on Assets (ROA) = Pre-tax ROA = $\frac{\text{EBT}}{\text{Avg total assets}}$

Post tax ROA = $\frac{\text{EAT} + \text{Interest}}{\text{Avg total assets}}$

- Either pre-tax or post tax ROA may be prepared
- **Pre-tax ROA** is generally preferred for analysis purposes

- Avg total assets = $\frac{1}{2}$ of opening & clg balances of the following- total assets or tangible assets or fixed assets.
- **Significance** : indicates net income per rupee of avg total assets or tangible or fixed assets

4. Earnings per share (EPS) =
$$\frac{\text{re sidual earnings}}{\text{No of equity shares}}$$

- Re sidual earnings = PAT- preference dividend
- No of equity shares outstanding =
$$\frac{\text{equity capital}}{\text{Face value per share}}$$
- **Significance** : income per share whether or not distributed as equity share

5. Dividend per share (DPS) =
$$\frac{\text{total equity dividend}}{\text{No of equity shares}}$$

- Total equity dividend = profits distributed to equity shareholders
- **Significance**: Profits distributed to per equity share.

6. Dividend pay-out ratio =
$$\frac{\text{Dividend per share (DPS)}}{\text{Earnings per share (EPS)}}$$

- **Significance**: % of EPS paid out & balance retained

7. Price earnings ratio (PE ratio) =
$$\frac{\text{market price per share}}{\text{Earnings per share (EPS)}}$$

- Market price per share = avg market price (or) closing price as per stock exchange quotations (MPS)
- **Significance**: Indicates relationship between MPS and EPS and shareholders perception of the company.

8. Dividend yield (%) =
$$\frac{\text{dividend}}{\text{Market price per share}}$$

- **Significance**: true return on investment, based on market value of shares .

9. Book value per share = net worth
$$\frac{\text{No of equity shares}}{\text{No of equity shares}}$$

- No of equity shares outstanding=
$$\frac{\text{equity capital}}{\text{Face value per share}}$$
- **Significance**: Basis of valuation of shares based on book values.

10. Market value to book value =
$$\frac{\text{marketprice per share}}{\text{Book value per share}}$$

- **Significance** : Higher ratio indicates better position for shareholders in terms of return & capital gains
- **Notes:**
- In problem tax rate is mentioned to calculate and given two years balance sheets.
$$\text{ROI} = \frac{\text{PAT (1-Tax)}}{\text{Average capital employed}}$$
- Two years balance sheet is given and debtors turnover ratio is not given calculate the average collection period =
$$\frac{\text{Avg debtors of two years}}{\text{Average sales per day}}$$

$$\text{Average sales per day} = \frac{\text{total sales}}{365}$$
- In problem return on total assets rate given PAT is calculated = Total assets X rate given in problem.

- In problem tax rate(t) and cost of debt (r) and return on investment (ROI) and financial leverage (D/E) is given to calculate ROE

$$ROE = [ROI + \{(ROI - r) \times D/E\}] (1 - t)$$

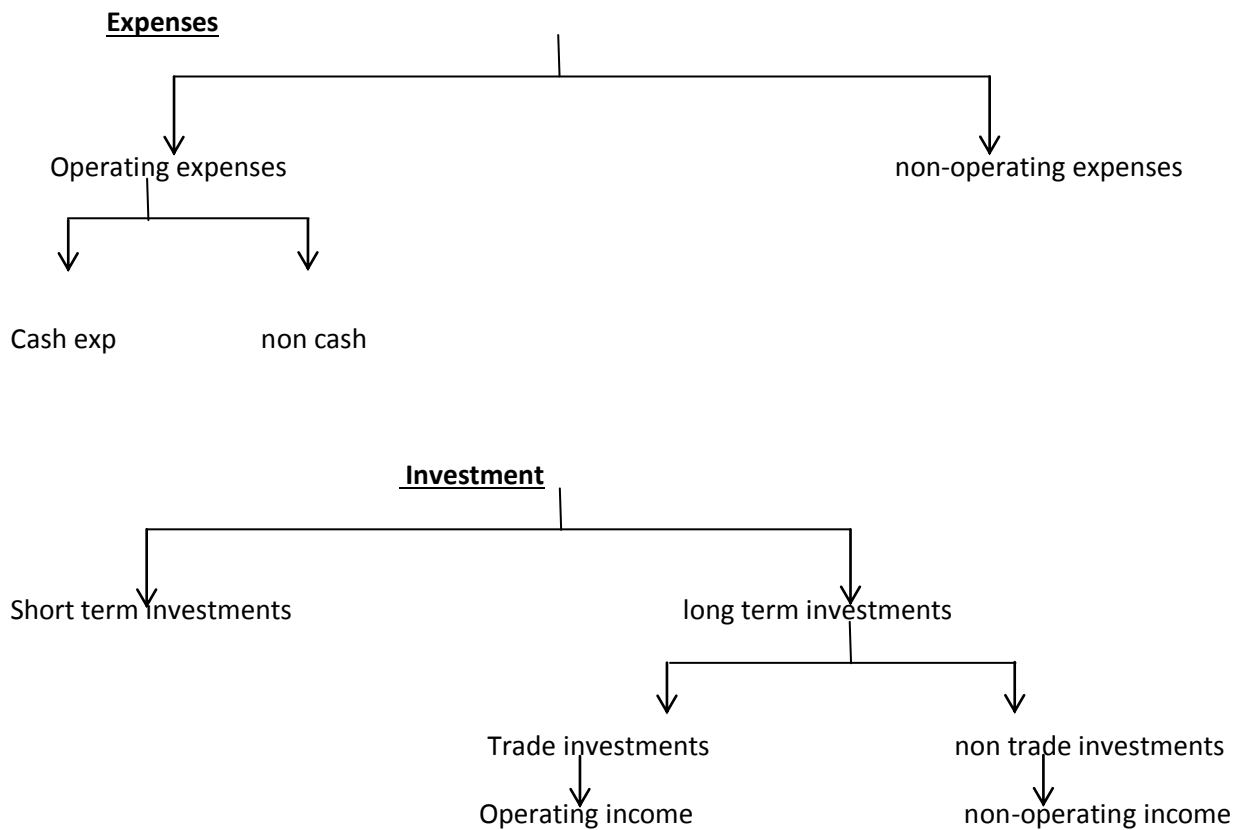
- Given problem tax rate is given to calculate

$$\text{Net profit margin} = \frac{EBIT (1 - t)}{\text{Sales}}$$

$$ROA = \frac{EBIT (1 - t)}{\text{Total assets}}$$

$$ROE = \frac{PAT}{\text{Equity}}$$

$$\text{Net cash flow} = PAT + Dep - (\text{dividend of preference and equity})$$

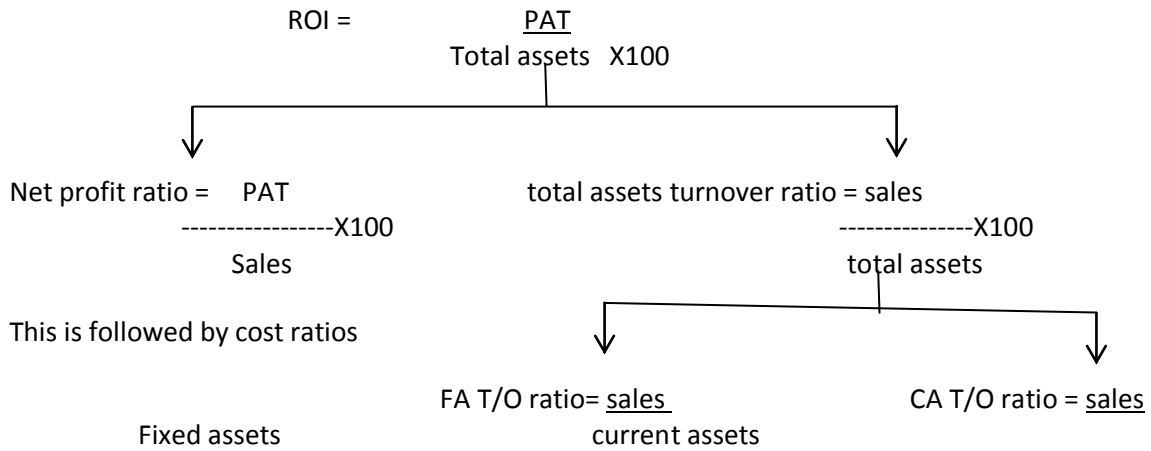


DUEPONT ANALYSIS – OVERALL PROFITABILITY OF FIRM

The overall profitability of a firm is comprising of two elements they are

1. Profitability on sales
2. The turnover of the firm's assets

These two factors interact and collectively determine the profitability of the firm



The analysis of profitability on the above pattern is known as DuPont analysis as it was developed by DuPont Corporation of USA.

This analysis shows that profitability depends not only on profit margin but also on how efficiently the firm has used its assets to generate sales.

DUPONT ANALYSIS – RETURN ON SHARE HOLDERS FUND

The DuPont analysis tells that return on shareholders fund is affected by three factors

1. Profit margin
2. Assets turnover
3. Financial leverage

$$\text{Return on shareholders' funds} = \frac{\text{PAT}}{\text{Shareholders fund or net worth}} \times 100$$

$\downarrow$
 Net profit ratio = $\frac{\text{PAT}}{\text{Sales}}$

$\downarrow$
 total assets t/o ratio = $\frac{\text{sales}}{\text{total assets}}$

$\downarrow$
 financial leverage = $\frac{\text{Total assets}}{\text{S.H funds}}$

$$\begin{aligned} \text{Return on shareholders' funds} &= \frac{\text{PAT}}{\text{Sales}} \times \frac{\text{sales}}{\text{total assets}} \times \frac{\text{total assets}}{\text{S.H funds}} \\ &= \frac{\text{PAT}}{\text{Total assets}} \times \frac{\text{Total assets}}{\text{S.H funds}} \end{aligned}$$

PAT

S.H funds

$$\begin{aligned} &= \frac{\text{Total assets}}{\text{Total assets}} \\ &= \frac{\text{ROI}}{\% \text{ of assets financial by shareholders fund}} \times 100 \end{aligned}$$

$$\begin{aligned} \text{Return on Shareholders fund} &= \frac{\text{ROI}}{\% \text{ of assets financial by shareholders fund}} \times 100 \\ \text{(As per DuPont analysis)} \end{aligned}$$

FUNDS FLOW STATEMENT

Procedure for preparing funds flow statement

Funds mean working capital. The procedure for preparation of funds flow statement is as under

- Prepare the schedule of changes in net working capital, and ascertain the Increase/Decrease. [Note current assets and current liabilities items will be considered in this schedule.]

Schedule of changes in Networking capital				
particulars	1 ST year	2 ND year	increase	decrease
A.current assets				
Inventories	xxxxxxx	xxxxxxx		xxxxxxx
sundry debtors	xxxxxxx	xxxxxxx	xxxxxxx	
cash and bank	xxxxxxx	xxxxxxx	xxxxxxx	
prepaid expenses	xxxxxxx	xxxxxxx		xxxxxxx
bills receivable	xxxxxxx	xxxxxxx	xxxxxxx	
subtotal of current assets (1)	xxxxxxx	xxxxxxx	xxxxxxx	xxxxxxx
B. current liabilities				
sundry creditors	xxxxxxx	xxxxxxx	xxxxxxx	
bills payable	xxxxxxx	xxxxxxx		xxxxxxx
outstanding expenses	xxxxxxx	xxxxxxx	xxxxxxx	
subtotal of current liabilities(2)	xxxxxxx	xxxxxxx	xxxxxxx	xxxxxxx
C. Net working capital (1-2)	xxxxxxx	xxxxxxx	xxxxxxx	xxxxxxx
Adjustment : increase of WC (or)	xxxxxxx			xxxxxxx
If decrease of WC		xxxxxxx	xxxxxxx	
Total	xxxxxxx	xxxxxxx	xxxxxxx	xxxxxxx

“Provision for tax and proposed dividend is considered as current liability if mentioned in question”.

- Analyse the Non – current liability accounts, viz Fixed assets , Investments,Capital,Loans,etc. to ascertain movement of funds as under-
 1. **Fixed assets:** sale / disposal or fresh purchase of fixed assets.
 2. **Investments:** sale of investments or additional investments made during the year.
 3. **Capital:** redemption/ buyback of shares or fresh issue of capital (at premium, if any).
 4. **Loans:** Repayment of loans or additional borrowing during the year.

Note: in the course of analysis in stage2

- **Non –cash items** – like depreciation, transfer to reserves, etc.
- **Non –operating items/ adjustments** – profit/loss on sale of assets/investments, etc. will also be identified.

Prepare profit and loss adjustment account for to find out Funds from operations

Profit and loss adjustment account			
Particulars	Amount	Particulars	Amount
To Depreciation provided	xxxxxxx	By balance b/d (opening p&l or R&S)	xxxxxxx
To Loss on sale of assets / investments	xxxxxxx	By profit on sale of assets/ investments	xxxxxxx
To transfer to reserves	xxxxxxx	By dividend received	xxxxxxx
To provision for tax provided	xxxxxxx	By interest received	xxxxxxx
To proposed dividend provided	xxxxxxx	By funds from operations (B/F)	xxxxxxx
To in term dividend provided	xxxxxxx		
To premium on redemption of debentures	xxxxxxx		
To goodwill written off	xxxxxxx		
To miscellaneous exp written off	xxxxxxx		
To balance c/d (closing P&L or R&S)	xxxxxxx		

Prepare the statement and application of funds (Fund flow statement)

Statement of sources and Application of funds			
sources of funds	Amount	Application of funds	amount
Decrease in net working capital	xxxxxxx	Increase in net working capital	xxxxxxx
Issue of equity/Preference shares	xxxxxxx	Buy back/Redemption of equity/preference shares	xxxxxxx
Issue of debentures /long term loans	xxxxxxx	Redemption of debentures/repayment of LT loans	xxxxxxx
Sale of fixed assets /Investments	xxxxxxx	Purchase of Fixed assets / Investments	xxxxxxx
Funds from operations	xxxxxxx	Taxes Paid	xxxxxxx
		Dividend Paid	xxxxxxx
		Interm dividend paid	xxxxxxx
		Funds lost in Operations (if any)	xxxxxxx

CASH FLOW STATEMENT

Cash flow statement is an Analytical Reconciliation statement of the difference in cash and bank, as under-

Two Methods for preparing cash flow statement

1. Direct method
2. Indirect method.

Direct method:

Cash flow from operating activities		
Cash receipts from customers for sale of goods / rendering of services	xxxxxxx	
Cash receipts from Royalties, fees, commission and other revenue	xxxxxxx	
Cash Payments to suppliers for goods and services	(xxxxxx)	
Cash payments to and on behalf of employees	(xxxxxx)	
Payments of expenses & overheads	(xxxxxx)	
Cash generated from Operations	xxxxxxx	
Tax paid	(xxxxxx)	
Net cash flow from Operating activities		xxxxxxx
Cash flow from Investing activities		
Sale of fixed assets and investments	xxxxxxx	
Purchase of fixed assets and Investments	(xxxxxx)	
Interest received	xxxxxxx	
Dividend received	xxxxxxx	
Net cash flow from Investing Activities		xxxxxxx
Cash flow from Financing activities		
Proceeds from issue of share capital	xxxxxxx	
Debentures , borrowings etc.	xxxxxxx	
Redemption of share capital	(xxxxxx)	
Redemption of debentures , borrowings	(xxxxxx)	
Dividend paid	(xxxxxx)	
Net Cash flow from Financing activities		xxxxxxx
cash and cash equivalents generation during the period		xxxxxxx
cash and cash equivalents at beginning		xxxxxxx
cash and cash equivalents at ending		xxxxxxx

Indirect method

Cash flow from operating activities

Profit before tax And extra ordinary items		xxxxxxx
Adjustment for		
Depreciation	xxxxxx	
Foreign Exchange loss	xxxxxx	
foreign exchange gain	(xxxxx)	
Interest / Dividend income	(xxxxx)	
interest paid	xxxxxx	
Preliminary expenses written off	xxxxxx	
loss on sale of investment /asset	xxxxxx	
Profit on sale of asset/ Investment	(xxxxx)	
Cash flow before changing working capital changes	xxxxxxx	
Increase of current assets	(xxxxx)	
decrease of current assets	xxxxxx	
increase of current liabilities	xxxxxx	
decrease of current liabilities	(xxxxx)	
cash flow from Operating activities	xxxxxxx	
tax paid	(xxxxx)	
net cash flow from operating activities		xxxxxxx
Cash flow from Investing activities		
Sale of fixed assets and investments	xxxxxxx	
Purchase of fixed assets and Investments	(xxxxxx)	
Interest received	xxxxxxx	
Dividend received	xxxxxxx	
Net cash flow from Investing Activities		xxxxxxx
Cash flow from Financing activities		
Proceeds from issue of share capital	xxxxxxx	
Debentures , borrowings etc.	xxxxxxx	
Redemption of share capital	(xxxxxx)	
interest paid	(xxxxxx)	
Redemption of debentures , borrowings	(xxxxxx)	
Dividend paid	(xxxxxx)	
Net Cash flow from Financing activities		xxxxxxx
cash and cash equivalents generation during the period		xxxxxxx
cash and cash equivalents at beginning		xxxxxxx
cash and cash equivalents at ending		xxxxxxx

If profit after tax (PAT) is given in problem to find out Profit before tax (PBT)

Profit after tax (PAT)	xxxx
Provision for tax	xxxx
Transfer to reserve	xxxx
Proposed dividend	<u>xxxx</u>
Profit before tax (PBT)	xxxx

CAPITAL BUDGETING

DECISION MAKING TECHNIQUES

Techniques of project evaluation

The following are some techniques of project evaluation

1. Simple payback period
2. Discounted payback period
3. Payback reciprocal
4. Accounting or average rate of return (ARR).
5. Net present value (NPV) or Discounted cash flow (DCF).
6. Profitability index (PI) or desirability factor or benefit –cost ratio.
7. Internal rate of return (IRR) and modified internal rate of return (MIRR).

Note: of the above, items 1, 3, and 4 are techniques that do not consider the time value of money.

Terms:

Sales	XXX
(-)Operating costs i.e. cash expenses	XXX
(-)Non-cash items i.e. depreciation	<u>XXX</u>
EBT	XXX
(-)Tax	XXX
EAT /PAT	XXX
(+)Depreciation	<u>XXX</u>
CFAT	<u>XXX</u>

1. Simple payback period :

- **Meaning:** payback period represents the time period required for complete recovery of the initial investment on the project. It is the period within which the total cash inflows from the project equals the cost of investment in the project. The lower the payback period, the better it is since initial investment is recovered faster.
- **Procedure for computation of simple payback period:**
 - a) Determine the initial investment (cash outflow) of the project.
 - b) Determine the CFAT (cash inflows) from the project for various years.
 - c) Compute payback period as under
 - In case of uniform CFAT per annum.
 - In case of differential CFAT for various years.

In case of uniform CFAT per annum:

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{CFAT per annum}}$$

In case of differential CFAT for various years:

- a) Compute the cumulative CFAT at the end of every year
- a) Determine the year in which cumulative CFAT > initial investment.
- a) Compute payback period = Time at which cumulative CFAT = initial investment (calculated on the time proportion basis)
- d) Accept project, if payback period is less than maximum or benchmark period, else reject the project.

simple payback period		
year	CFAT	cumulative CFAT

2. **Discounted payback period:** when the payback period is computed after discounting the cash flows by a predetermined rate (cut off rate), it is called as the **discounted payback period**. It is computed as under.

- Determine the total cash outflow of the project (initial investment)
- Determine the cash inflow after taxes (CFAT) for each year of project life.
- Determine the PV factor for each year, and compute discounted CFAT (DCFAT) for each year. **Note:** DCFAT=CFAT of each year X PV factor for that year.
- Determine the cumulative DCFAT at the end of every year of project life.
- Determine the year in which cumulative DCFAT exceeds initial investment.
- Compute discounted payback period as the time at which cumulative DCFAT = initial investment. This is calculated on “time proportion basis “.
- Accept the project, if discounted payback period less than maximum/benchmark period, else reject the project.

discounted payback				
year	CFAT	pv @ rate	DCFAT	cumulative DCFAT

PAYBACK RECIPROCAL

1. **Meaning:** it is the reciprocal of payback period. It is computed as
$$\frac{\text{average annual cash inflows CFAT}}{\text{Initial investment}}$$
2. **Utility :** the payback reciprocal is considered to be an approximation of the internal rate of return , if
 - ✓ The life of the project is at least twice the payback period, and
 - ✓ The project generates equal amount of the annual cash inflows.
3. **Example:** a project with an initial investment of 50 lakhs and life of 10 years generates CFAT of 10 lakhs per annum. It's payback reciprocal will be
$$\frac{10 \text{ lakhs}}{50 \text{ lakhs}} = 20\%$$

ACCOUNTING OR AVERAGE RATE OF RETURN (ARR)

1. **Meaning:** accounting or average rate of return (ARR) means the average annual yield on the project. In this method, profit after taxes (i.e., PAT, instead of CFAT) is used for evaluation.
2. **Formula:**
$$\text{ARR} = \frac{\text{average PAT p.a}}{\text{Net initial investment}}$$

$$\text{Average PAT p.a} = \frac{\text{total PAT during project life}}{\text{No of years of project life}}$$

Net initial investment = initial investment – salvage value.

NET PRESENT VALUE (NPV) OR DISCOUNTED CASH FLOW (DCF) TECHNIQUE

1. **Meaning:** the net present value (NPV) of a project is the sum of the present values of all future cash inflows (-) the sum of the present values of all cash outflows associated with the proposal. NPV represents the additional value created with the cash available in hand now for the investment.

NPV is calculated as under:

NPV= discounted cash inflows (-) discounted cash outflows.

NPV= total discounted CFAT (DCFAT) (-) initial investment.

$$\text{NPV} = \frac{\text{FV}_1}{(1+k)^1} + \frac{\text{FV}_2}{(1+k)^2} + \dots + \frac{\text{FV}_n}{(1+k)^n}$$

Note: K = discount rate, FV= future cash inflows arising at points of time 1,2,3,4...N
Initial investment pertains to time 0 and is hence not discounted.

2. Procedure for computation of NPV :

- ✓ Determine the **total cash outflow of the project** and the time periods in which they occur.
- ✓ Compute the **total discounted cash outflow = outflow X PV factor.**
- ✓ Determine the **total cash inflows of the project** and the time periods in which they arise.
- ✓ Compute the **total discounted cash inflows = inflow X PV factor.**
- ✓ **Compute NPV= discounted cash inflows (-) discounted cash outflows**

- ✓ **Accept project, if NPV is positive, else reject the project.**

Note:

- Generally , **cash outflows consist of**
 - a) Initial investment which occurs at time “0” and
 - b) Special payments and outflows, e.g. working capital outflow which arises in the year of commercial production, **tax paid on capital gain on sale of old asset**, of any.
- **Cash inflows include** CFAT of each year, and also specific inflows like salvage value of new assets and recovery of working capital at the end of the project , **Tax savings on loss on sale of old asset, etc.** the general assumption is that all cash inflows occur at the end of each year.
- **PV factor = $\frac{1}{(1+k)^n}$** Where k = cost of capital and n= year in which the inflow or outflow

3. Decision making or acceptance rule :

NPV>0 = accepts the project. Surplus over and above the cut off rate is obtained.

NPV=0 = project generates cash flows at a rate just equal to the cost of capital. Hence, it may **either accepted or be rejected** .this constitutes an indifference point.

NPV<0 = Reject the project. The project does not provide returns even equivalent to cut off rate.

Note: NPV method is based on the assumption that all intermediate / future cash flows can be immediately re invested at a rate of return equal to the firm's cost of capital.

PROFITABILITY INDEX (PI)

1. Meaning: where different investment proposals each involving different initial investments and cash inflows are to be compared, the profitability index (PI) technique is used.

$$PI = \text{desirability factor or benefit cost ratio} = \frac{\text{total discounted cash inflows (DCFAT)}}{\text{Total discounted cash outflows initial invest}}$$
2. Significance: PI represents the amount obtained at the end of the project life, for every rupee invested in the project. The higher PI it is, since the greater is the return for rupee of investment in the project.
3. Decision making or acceptance rule :
 - PI >0 = accepts the project.** Surplus over and above the cut off rate is obtained.
 - PI=0** = project generates cash flows at a rate just equal to the cost of capital. Hence, it may **either accepted or be rejected** .this constitutes an indifference point.
 - PI<0 = Reject the project.** The project does not provide returns even equivalent to cut off rate.

Note: When NPV>0, PI will always be greater than 1. Both NPV and PI use the same factors, i.e, discounted cash inflows (A) and discounted cash outflows (B) , in the computation.

NPV = A-B, whereas $PI = \frac{A}{B}$

INTERNAL RATE OF RETURN

Meaning: internal rate of return (IRR) is the rate at which the sum total of discounted cash inflows equals the discounted cash outflows. So IRR of the project is the discount rate at which NPV of the project equal to zero.

IRR refers to that discount rate K, such that

$$= \frac{FV_1}{(1+k)^1} + \frac{FV_2}{(1+k)^2} + \dots + \frac{FV_n}{(1+k)^n} \text{ less initial invest 0}$$

At IRR, NPV = 0 and PI= 1

Note: discount rate (i.e. Cost of capital) is assumed to be known and constant in the computation of NPV, while in computation of IRR, the NPV is set equal to zero, and the discount rate which satisfies this condition is calculated.

Interpretation: IRR can be interpreted in two ways

- ✓ IRR represents the rate of return on the unrecovered investment balance in the project.
- ✓ IRR is the rate of return earned on the initial investment made in the project.

Of these, the first view seems to be more realistic, since it may not always be possible for a firm to re investment intermediate cash flows at a rate equal to the IRR.

Procedure for computation of IRR

- Determine the total cash outflow of the project and the time periods in which they occur.
- Determine the total cash inflows of the project and the time periods in which they arise.
- Compute the NPV at an arbitrary discount rate say 10%.
- Choose another discount rate and compute NPV. The second discount rate is chosen in such a way that one of the NPV's is negative and the other is positive. Suppose, NPV is positive at 10%, choose a higher discount rate so as to get a negative NPV. In case NPV is negative at 10%, choose a higher discount rate so as to get a negative NPV. In case NPV is negative at 10%, choose a lower discount rate.
- Compute the change in NPV over the two selected discount rates.
- On proportionate basis, compute the discount rate at which NPV equals zero.

Decision making or acceptance rule:

IRR > K₀ = accepts the project. Surplus over and above the cut off rate is obtained.

IRR=K₀ = project generates cash flows at a rate just equal to the cost of capital. Hence, it may **either accepted or be rejected** .this constitutes an indifference point.

IRR<K₀ = Reject the project. The project does not provide returns even equivalent to cut off rate.

MODIFIED INTERNAL RATE OF RETURN (MIRR):

Modified internal rate of return is computed as under

- Determine the total cash outflows & inflows of the project and the time periods in which they occur.
 - Compute terminal value of all cash flows other than the initial investment. For this purpose, terminal value of a cash flow = amount of cash flow X re investment factor, where Reinvestment factor= $(1+k)^n$ where n= number of years balance remaining the project.
 - Compute total of terminal values as computed under step 2. This is taken as the "inflow" from the project, to be compared with the "outflow", i.e. the initial investment.
 - Compute MIRR, i.e. the interpolation techniques applicable to IRR may be used.
- Note: for computing MIRR, the interpolation techniques applicable to IRR may be used.

