

Fundamentals of Financial Management- IV Sem

Syllabus

Module 1

Financial management- an overview- FM- Meaning, definition, importance- scope, traditional and modern approach- changing role of financial manager- financial decisions- objectives of FM, profit V/s wealth management- organisation of finance function in corporate setup.

Time value of money- meaning and significance.

Module II

Capital budgeting decisions- meaning, significance and process- nature of projects for investments. Cash flows v/s accounting profits. Long term investments evaluation techniques- traditional techniques (ARR, Payback period), discounted techniques (NPV, IRR, PI and discounted Payback)- simple problems.

Module III

Concept and measurement of cost of capital- definition and importance, factors affecting cost of capital. Concepts- historical and future, explicit and implicit, marginal and specific, WACC. Measurement of specific cost, cost of debt, preference, equity and retained earnings- computation of overall cost based on book value and market value weights.

Module IV

Financing decisions and dividend decisions

Meaning and significance of capital structure, factors affecting capital structure, concept of leverage- meaning, types- financial, operating and combined- computation, EBIT-EPS analysis.(simple problems)

Meaning of dividend and dividend policy-walter's model, Gordon's model, M-M Hypothesis-internal and external factors affecting dividend policy- forms of dividends. (Problems on Walter and Gordon's model)

Module I

Meaning: FM means planning, organising, directing and controlling the financial activities such as procurement and utilisation of the funds of the enterprise. Applying the general management principles to financial resources.

Definitions:

According to Solomon, 'It is concerned with the efficient use of an important economic resource namely, capital funds'.

"Financial Management deals with procurement of funds and their effective utilisation in the business"- according to S C Kuchal

“The operational activity of a business that is responsible for obtaining and effectively utilising the funds necessary for efficient operations”- Joshep and Massie

Importance:

Finance is the life blood of every business. The business goal can be achieved only with the help of effective management of finance. The following are some of the importance.

1. Financial planning: it helps in determining the financial requirement of the business concern.
2. Acquisition of funds: it helps in finding different sources of funds and their relative costs.
3. Proper use of funds: proper use of funds helps in improving the operational efficiency of the business.
4. Financial decision: helps in taking sound financial decision. It involves all the departments like marketing, production, personnel etc.
5. Improve profitability: Profitability of any concern depends on the effectiveness and proper utilisation of funds by the business concern.
6. Increases the value of the firm: helps in increasing the wealth of the investors and the business concern.
7. Promoting savings: savings are possible only when the business concern earns higher profitability and maximising wealth. Effective financial management helps to promote and mobilise individual and corporate savings.

Scope of financial management:

The financial management approach may be broadly divided into two parts

- I. Traditional approach
- II. Modern approach

Traditional approach:

It was followed during 1920-1950. This approach is based on the past experience and the traditionally accepted methods. It consisted of the following areas

1. Arrangement of funds from the lending body
2. Arrangement of funds through various financial instruments
3. Finding various sources of funds.

Modern approach:

Under the modern approach, financial management is concerned not only with the raising of funds, but also with the wise application of the funds raised. The important areas are,

1. Estimation of capital requirements
2. Determination of capital composition
3. Choice of sources of funds
4. Investment of funds
5. Disposal of surplus
6. Management of cash
7. Financial controls

Financial Management and other subjects:

1. Financial management and economics- investment decisions, micro and macro environmental factors are closely associated with the functions of financial manager. Financial management also uses the economic equations like money value, discount factor, EOQ etc.
2. Financial management and accounting: Accounting records includes the financial information of the business concern. In olden days, financial management and accounting were treated as same discipline.
3. Financial management and mathematics: Modern approaches of the financial management applies a large number of mathematical and statistical tools and techniques. They are also called econometrics.
4. Financial management and production management: Production management is the operational part of the business concern, which help to multiple the money into profit. Profit of the concern depends upon the production performance.
5. Financial management and marketing: Marketing department needs finance to sell the products. The finance manager has to allocate funds for various activities of marketing.
6. Financial management and Human resource: Finance manager should carefully evaluate the requirement of manpower to each department and allocate the finance to human resource department as wages, salary, commission, bonus, pension etc.
7. Top management and finance management: Strategic planning and management control are two important functions of the top management. Finance function provides the basic inputs needed for undertaking these activities.

Objectives of financial management:

1. Profit maximisation
2. Wealth maximisation

Profit maximisation:

The traditional approach of financial management was all about profit maximisation. Profit ensures maximum welfare to the shareholders, employees and creditors and increases the confidence of the management of the business. The profit of the organisation can be maximised by,

1. Increasing the sales and thereby increasing the revenue
2. By reducing the cost of production through efficient use of the resources available
3. By making a judicious choice of funds and reducing the cost of capital
4. By minimising risks.

Arguments in favour of profit maximisation:

1. Main aim of any business is to earn profit.
2. Profit is the parameter of the business operations.
3. Profit reduces risk of the business
4. Profit is the main source of finance
5. Profitability meets the social needs also.

Arguments against profit maximisation:

1. May lead to exploitation of workers and consumers.
2. Creates immoral practices such as corrupt practices, unfair trade practices etc.
3. May lead to inequalities among the stake holders such as customers, suppliers, shareholders etc.

Drawbacks of profit maximisation:

1. The concept is vague
2. It ignores the time value of money
3. It ignores risk factor

Wealth maximisation:

Modern approach believes in wealth maximisation. It refers to the maximisation of wealth by maximising the market value of shares of the company. It involves increasing the earnings per share of the shareholders.

Wealth = Gross Present Worth - Expected Benefits

Arguments in favour of wealth maximisation:

1. Wealth maximisation is superior to profit maximisation
2. Considers the comparison of the value to cost associated with the business.
3. Provides exact value of the business.
4. Considers both time value and risk of the business.
5. Provides efficient allocation of resources.
6. Ensures the economic interest of the society.

Arguments against wealth maximisation:

1. May not be suitable to present day business activities.
2. It is also profit maximisation and is the indirect name for profit maximisation.
3. Creates ownership-management controversy.
4. Management also enjoys certain benefits.
5. The ultimate aim of the wealth maximisation objective is to maximise profit.
6. Wealth maximisation can be activated only with the help of the profitable position of the business concern.

Superiority of wealth maximisation over profit maximisation:

1. Business may have several other objectives other than profit maximisation. Companies may have goals like larger market share, high sales, greater stability and so on. Profit maximisation did not take into account these factors.
2. Profit maximisation has to define after taking into account, factors like short term, medium term and long term profits, profits over period of time etc. but these points are ignored.
3. Social responsibility is one of the most important objective of many firms. But profit maximisation concept ignores it.
4. Wealth maximisation is based on the concept of cash flows. Cash flows are a reality and not based on any subjective interpretations.
5. Wealth maximisation considers time value of money.

Changing role of finance manager:

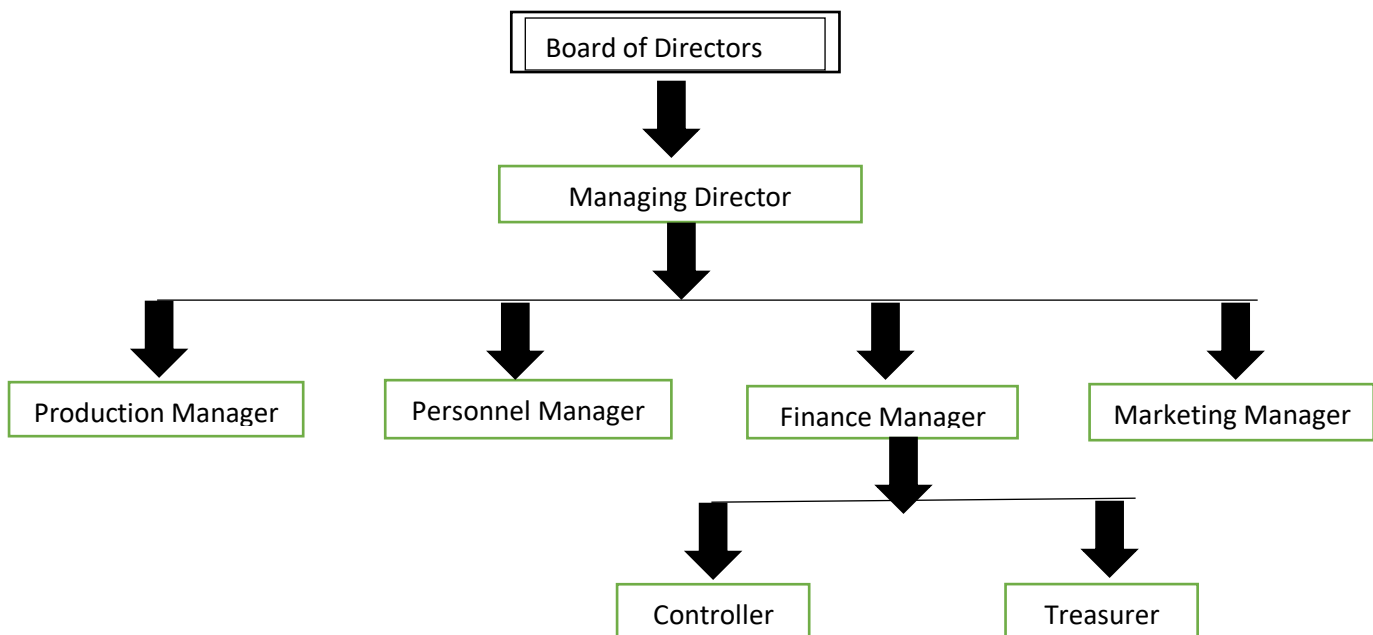
1. Financial planning: The primary responsibility of the finance manager is to forecast the needs and sources of finance and ensure adequate supply of funds at the proper time for the smooth running of the business.

2. Raising of necessary funds: The finance manager has to see whether the funds are required for short term, medium or long term purposes. It helps in deciding the nature, terms and sources of finance.
3. Controlling the use of funds: It is the responsibility of the finance manager to see that the funds collected are properly and effectively utilised. The inflow and outflow of the funds are to be controlled properly.
4. Appropriation of profits: The financial manager is also responsible for the proper appropriation of profits. He advises the top management as to how much profit should be retained and how much can be distributed as dividend to shareholders.
5. Wealth maximisation: The most important responsibility of the finance manager is to fulfil the objectives of wealth maximisation which results in the economic welfare of the owners.
6. Other responsibilities:
 - a. Responsibilities to owners: To protect the interests of the shareholders, the finance manager has to ensure a fair and steady return on their investment and appreciation in the value of their shares.
 - b. Responsibilities to the employees: It is the responsibility of the finance manager to see that the employees are paid fair and adequate wages and are given all incentives to improve their efficiency and productivity.
 - c. Responsibilities to creditors: The creditors of the business are to be paid interest and principal amount promptly to maintain a high credit-standing.
 - d. Responsibilities to customers and the society: The finance manager should see that the firm produces quality products at minimum cost and sells at competitive price in the market to protect the interests of the customers. At the same time, the manager is also socially responsible to see that the firm does not create any environmental pollution.

Financial decisions:

1. Funds requirements decision: Done by taking into account both the fixed and working capital requirements of the business.
2. Financing decision: it involves,
 - a. Identification of the sources of funds
 - b. Determination of the amount of funds that can be raised from each source
 - c. Ascertainment of the cost of capital
 - d. Determination of future cost of capital
 - e. Determination of the best available sources
 - f. Determination of the optimum or best financing mix
3. Investment decision:
 - a. Where to invest the funds
 - b. What should be the amounts that should be invested on different proposals.
 - c. Re-allocation of resources
4. Dividend decision: By taking into consideration the trend of earnings, the stability of earnings, the tax position, the preference of the shareholders, the market price of the shareholders, the liquidity position etc.

Organisation of finance function in corporate setup



Time value of money- meaning and significance

Money has time value that means, the value of money changes over a period of time. The value of a rupee received today is different from the value of a rupee to be received after a year.

Factors determining time value of money:

1. People prefer current consumption of goods and services to future consumption. Therefore they prefer to have a certain amount of money today than to have it tomorrow.
2. Money can be invested today to get some returns in the future.
3. Inflation- inflation reduces the purchasing power of money
4. 'A bird in hand is worth two in the bush'

Importance of time value of money:

Many financial decisions of every business undertaking involve the evaluation of the cash flows or cash earnings from a financial action at different points of time. This has led to the recognition of time value of money.

Different calculations connected with the time value of money:

1. Calculation of future value of single cash flow
2. Calculation of the future value of an annuity
3. Calculation of the present value of a single cash flow

4. Calculation of the present value of an annuity

Calculation of the future value of a single cash flow:

- a. Calculation of the future value of single cash flow after one year:

Formula: $P+r$

P refers to the present cash outlay or the principal amount

r refers to the interest on the principal amount.

- b. Calculation of the future value of a single cash flow after two or more years.

$F=P(1+r)^n$

F= future value of the single cash flow

P= present cash outlay/principal amount

r= rate of interest per annum

n= number of years

example: the present cash outlay is ₹ 10000. It is invested for one year at 10% interest. Calculate the future value after one year.

Particulars	Rs
Present cash outlay	10,000
Add: interest @ 10% for one year $10,000 \times 10/100$	<u>1,000</u>
Future value	<u>11,000</u>

Calculate the future value of ₹ 10,000 invested at 10% interest for 3 years.

Future value after one year

Particulars	Rs
Present cash outlay	10,000
Add: interest @ 10% for one year $10,000 \times 10/100$	<u>1,000</u>
Future value	<u>11,000</u>

Future value after two years

Particulars	Rs
Present cash outlay	11,000
Add: interest @ 10% for one year $11,000 \times 10/100$	<u>1,100</u>
Future value	<u>12,100</u>

Future value after three years

Particulars	Rs
Present cash outlay	12,100

Add: interest @ 10% for one year $12,100 \times 10/100$	<u>1,210</u>
Future value	<u>13,310</u>

The same can be calculated with the formula

$$F = P(1+r)^n$$

$$P = 10,000 \quad r = 10\% \quad n = 3$$

$$F = 10,000(1+10/100)^3$$

$$F = 10,000(1+0.10)^3$$

$$= 10000(1.10)^3$$

$$= 10,000(1.331) = \underline{\underline{13,310}}$$

Calculation of future value of an annuity:

There are different types of annuities

- Deferred annuity: Where the cash flow occurs at the end of each period.
- Annuity due: Annuity due is an annuity where the cash flow occurs at the beginning of each period.
- Annuity certain: when an annuity is payable or receivable for a given length of time, it is annuity certain.
- Perpetuity: when the payments or receipts are to continue for ever in perpetuity.

Example: A depositor deposits Rs 1000 at the end of every year for 5 years at an interest of 10% per year. Calculate the future value at the end of five years.

$$= 1000(1.10)^4 + 1000(1.10)^3 + 1000(1.10)^2 + 1000(1.10)^1 + 1000$$

$$= 1000(1.4640) + 1000(1.3310) + 1000(1.2100) + 1000(1.10) + 1000$$

$$= 1464 + 1331 + 1210 + 1100 + 1000$$

$$= \underline{\underline{6,105}}$$

2. When the deposit is made at the beginning of the year

A depositor deposits Rs 1000 at the beginning of every year for 5 years at an interest of 10% per year. Calculate the future value at the end of five years.

$$= 1000(1.10)^5 + 1000(1.10)^4 + 1000(1.10)^3 + 1000(1.10)^2 + 1000(1.10)^1$$

$$= 1000(1.6104) + 1000(1.4640) + 1000(1.3310) + 1000(1.2100) + 1000(1.10)$$

$$= 1,610.4 + 1464 + 1331 + 1210 + 1100 = 6715.4$$

Calculation of the Present value of Single cash flow:

$$\text{Formula: } P = \frac{F}{(1+r)^n}$$

Example: the value of a single cash flow after two years from now is Rs. 2000. The rate of interest is 5% per annum. Calculate the present value of the single cash flow.

$$P = \frac{F}{(1+r)^n}$$

$$P = ? \quad F = 2000 \quad r = 5\% \text{ or } 0.05 \quad n = 2$$

$$P = \frac{2000}{(1 + 0.05)^2}$$

$$P = \frac{2000}{1.1025}$$

$$P = \underline{1814.06}$$

Calculation of present value of an annuity:

Example: The cash flow from an investment is Rs. 1000 per year for 3 years. Each cash flow is occurring at the end of the year. The discount rate is 10%. Calculate the present value.

$$P = \frac{F_1}{(1+r)^1} + \frac{F_2}{(1+r)^2} + \frac{F_3}{(1+r)^3}$$

$$= \frac{1000}{(1+0.10)^1} + \frac{1000}{(1+0.10)^2} + \frac{1000}{(1+0.10)^3}$$

$$= \frac{1000}{(1.10)^1} + \frac{1000}{(1.10)^2} + \frac{1000}{(1.10)^3} = \frac{1000}{(1.10)} + \frac{1000}{(1.21)} + \frac{1000}{(1.331)}$$

$$= 909.09909 + 826.4463 + 751.3148 = \underline{2,486.86}$$

Differential cash flow: when the cash inflows or the outflows are different in different years.

Module II

Capital budgeting decisions

Meaning: Capital budgeting is the planned expenditure on capital investments or projects. It is the long-term plan for the proposed capital outlays. It is the process of deciding whether or not to commit resources to a capital project whose benefits would be spread over several time periods.

Definitions:

“Capital budgeting is the process of deciding whether or not to commit resources to projects whose costs and benefits are spread over several time periods”. - Herold Bierman Jr and Thomas R Dyckman.

“A firm’s formal planning process for the acquisition and investment of capital” – Hampton John J.

“Capital budgeting is long-term planning for making and financing proposed capital outlays” – Charles T Horngren

Need for capital budgeting:

1. Projects involve huge financial resources and they have far-reaching implications on the working of the business.
2. The funds are permanently blocked. The decisions once taken cannot be easily reversed.
3. The funds are recovered over a long period of time.
4. Completion of a capital project may take time, without proper control system, costs may go up.
5. Most difficult to make

Objectives:

1. To allocate the available funds among the competing capital projects in order to maximise the total profitability.
2. To evaluate the various capital projects and establish priorities.
3. To establish proper co-ordination
4. To maintain effective control on the cost of expenditure.
5. To minimise probable losses and wastages.
6. To provide basis for planning long-term financial requirements.

Importance/advantages:

1. Helps in taking right decisions
2. Facilitates proper adjustment of production facilities with the sales budget.
3. Provides basis for long-term financial planning.
4. Avoids over-investment
5. Indicates proper timing for purchase of fixed assets.
6. Helps in controlling capital expenditure.
7. Provides information for cash budgeting.
8. Helps in deciding the finance requirements in advance.

Limitations:

1. It is a very difficult task
2. It is subject to all the limitations of budgeting.

Process or steps involved in capital budgeting:

1. Project generation: Collect the list of all available projects
2. Project evaluation: The evaluation of different projects in terms of costs and the expected returns.
3. Project selection: Choosing of the most profitable proposals.
4. Project execution: The implementation of the selected projects.
5. Follow-up: Assessment of the results of the projects that have been implemented.

Nature of projects:

1. Mutually exclusive projects: These are the projects which are competing with each other. The accepting of one project may compel the rejecting of the other.
2. Independent projects: These are the projects which are not competing with each other. Any number of projects can be taken up.
3. Contingent projects: These are the projects, where if one project is selected, it compels to take another project.

Cash flows v/s accounting profits:

Cash flows are the cash coming into the business out of the projects in future. Accounting profits are those which is shown in the accounting books at the end of a particular year after considering many items which may be mere book entry. It may not involve the real inflow or outflow of cash.

Long term investments evaluation techniques

- I. Discounted cash flow techniques
 - a. Net Present Value (NPV)
 - b. Internal Rate of Return (IRR)
 - c. Profitability Index (PI)
- II. Non Discounted /traditional cash flow technique
 - a. Pay Back Period
 - b. Discounted Pay Back
 - c. Accounting Rate of Return (ARR)

Discounted cash flow techniques:

These techniques recognise the time value of money. The cash inflows of different years are discounted to their present values.

Merits of discounted cash flow methods:

1. Considers the cash inflows of a project over the entire economic life.
2. Considers the principle of time value of money.
3. Provides for uncertainty and risk.
4. More scientific and dependable.

Demerits:

1. More complicated and involve more calculations.
2. Do not consider the accounting concepts.
3. Not suitable when the projects require different cash outlay.

Net present value method:

Features:

1. Ascertainment of net present value
2. Selection criterion or decision rule- select the projects with positive NPV
May select the project where NPV is equal to zero
Reject the projects with negative NPV.

Advantages:

1. Recognises time value of money.
2. Considers the entire economic life of the project.
3. Considers the objective of maximum profitability.
4. Useful for the evaluation of mutually exclusive projects.
5. More scientific and dependable method.

Disadvantages:

1. It is not easy to determine an appropriate rate of discount.
2. It is more difficult to understand.
3. Estimation of exact economic life of the project is difficult.
4. It may be suitable for ranking the projects requiring unequal capital outlay.

Calculation of NPV:

$$NPV = \sum PVC_t - P$$

$\sum PVC_t$ = Total of the present values of all the cash flows.

Present value of cash flows can be calculated either by using the formula or by referring the present value table.

If we are using the table,

$$P = C (PVf)$$

(PVf) = the value we get in the present value table.

Eg: A company is considering the purchase of any one of the following assets, the details are given below.

	Machine 1	Machine 2
Estimated life	3 years	3 years
Initial capital outlay	10,000	10,000
Earnings after tax		
I year	8,000	2,000
II Year	6,000	7,000
III Year	4,000	10,000

Assuming a 10% cost of capital, suggest which machine is beneficial according to NPV method.

Calculation of present values:

Year	PV factors at 10%	Machine 1		Machine 2	
		Cash flow	Present value	Cash flow	Present value
01	0.909	8000	7272	2000	1818
02	0.826	6000	4956	7000	5782
03	0.751	4000	3004	10000	7510
Total of Present Values $\sum PVC_t$			15,232		15,110

$$\text{Present value} = 8000(0.909) + 6000(0.826) + 4000(0.751) = 15232$$

NPV of Machine 1

$$NPV = \sum PVC_t - P \qquad \sum PVC_t = 15,232, \qquad P = 10,000$$

$$NPV = 15,232 - 10,000 = \underline{\underline{5232}}$$

Machine 2

$$NPV = \sum PVC_t - P \qquad \sum PVC_t = 15,110, \qquad P = 10,000$$

$$NPV = 15,110 - 10,000 = \underline{\underline{5110}}$$

Internal Rate of Return:

It is defined as the rate that equates the present value of the expected cash flows with the present cash outlay. Or, it is that rate where the NPV is equal to zero.

$$\sum PV C_t - P = 0$$

Accept-reject criteria:

The calculated IRR is compared with the cut off rate fixed by the organisation.

IRR is denoted as 'r'

Cut off rate is taken as 'k'

When $r > k$ -----accept

When $r = k$ ----- may accept

When $r < k$ -----reject

Advantages:

1. Recognises time value of money
2. Considers all the cash flows.
3. Reveals the maximum rate of return expected and shows the profitability.
4. IRR is more meaningful.

Disadvantages:

1. Understanding is difficult.
2. Calculation is tedious.
3. The results of NPV and IRR may differ.

Calculation of IRR:

1. In case of single cash flow:

Locating the discount factor: $f = \frac{I}{C}$

I = Initial capital investment

C = annual cash flows

F = the factor to be located in the present value of annuity table.

Locate the rate in the table as per the 'f' and the number of years.

2. When the cash flows are not equal:

Use trial and error method.

Steps:

1. Assume a rate as IRR and calculate the NPV and see whether NPV = 0.
2. If not, try another rate higher or lower to the first trial rate till you get NPV=0.
3. When you try two trial rates, and you get one positive NPV and the other negative, use the formula

$$4. \text{ IRR} = \text{LTR} + \frac{\text{NPV at LTR}}{\text{NPV at LTR} - \text{at HTR}} \times \text{Difference between trial rates}$$

LTR= Lower trial rate
HTR = Higher trial rate

Eg: calculate IRR from the following.

A machine cost Rs 20,000. The annual cash flows are, Rs 5000, 5500, 6000, 5500 and 7000.

Let us assume the IRR as 6%

Year	Cash flows	PV factors at 6%	PV
01	5000	0.943	4715
02	5500	0.890	4895
03	6000	0.840	5040
04	5500	0.792	4356
05	7000	0.747	5229
Total PV			24235

$$\text{NPV} = 24235 - 20000 = 4235$$

NPV is not equal to zero.

Let's try 9%

Year	Cash flows	PV factors at 9%	PV
01	5000	0.917	4585
02	5500	0.842	4631
03	6000	0.772	4632
04	5500	0.708	3894
05	7000	0.650	4550
Total PV			22292

$$\text{NPV} = 22292 - 20000 = 2292$$

NPV is not equal to zero.

Formula

$$1. \text{ IRR} = \text{LTR} + \frac{\text{NPV at LTR}}{\text{NPV at LTR} - \text{at HTR}} \times \text{Difference between trial rates}$$

$$\text{IRR} = 6 + \frac{4235}{4235 - 2292} \times (9 - 6)$$

$$= 6 + \frac{4235}{1943} \times (3)$$

$$= 6 + 2.179 (3)$$

$$= 6 + 6.537$$

$$= \underline{12.537}$$

Profitability Index:

It is a relation between present value of cash inflows and the present cash outlay.

$$PI = \frac{\sum PV C_t}{P}$$

Accept/Reject criteria:

Accept when PI is greater than 1

May accept when PI is equal to 1

Reject when PI is less than 1.

Eg: the initial investment of a project is Rs 1, 00,000 and the cost of capital is 10%. The expected cash flows are, Rs 40,000, 30,000, 50,000 and 20,000.

Compute profitability index.

Year	Cash flows	PVf at 10%	PV
01	40,000	0.909	36360
02	30,000	0.826	24780
03	50,000	0.751	37550
04	20,000	0.683	13660
Total PV			1,12,350

$$PI = \frac{\sum PV C_t}{P} PI = \frac{1,12,350}{100,000} = \underline{1.1235}$$

Payback period method:

Payback period refers to the period in which the project generates the necessary cash to recover the initial investment.

Accept/reject criterion:

- a. Accept the project when PBP is less than the standard years
- b. May accept when the actual PBP is equal to the standard
- c. Reject when the payback period is more than the standard.

Calculation:

- 1. In case of even/equal cash flows:

$$PBP = \frac{\text{Initial Investment}}{\text{Annual cash flows}}$$

Eg: a project requires Rs 20,000 as initial cash investment and it generates an annual cash flow of Rs 5,000 for ten years. Calculate the payback period.

$$PBP = \frac{20000}{5000} = 4 \text{ years}$$

- 2. Uneven cash flows:

Eg: if the project requires Rs 20,000 initial investment and the annual cash flows for 5 years are 6,000, 8,000, 5,000, 4,000 and 4,000 respectively, calculate the payback period.

Year	Cash flows	Cumulative cash flows	
01	6,000	6,000	Ist year
02	8,000	14,000	IInd Year
03	5,000	19,000	III Year
04	4,000	23,000	20,000-19000=1000
05	4,000		

Payback period doesn't require full of fourth year, so we need to calculate the fraction of the year.

Fourth years cash flow is Rs 4000, but we require only Rs 1,000.

$$\frac{12}{4000} \times 1000 = 3 \text{ MONTHS}$$

Therefore, the payback period is 3 years and 3 months.

Average Rate of Return/ Accounting Rate of Return:

$$\text{ARR} = \frac{\text{Annual average net earnings after taxes}}{\text{average investment over the life}} \times 100$$

Or

$$\text{ARR} = \frac{\text{Annual average net earnings after taxes}}{\text{original investment}} \times 100$$

Where annual net earnings average is the average of the earnings after depreciation and taxes.

In case of annuity, the average net earnings is equal to any year's earnings.

Calculation of average investment:

- I. When there is no salvage value:
AI = Initial investment / 2
- II. When there is salvage value:
AI = (Initial investment - salvage value) / 2
- III. When there is working capital:
AI = (Initial investment - salvage value) / 2 + working capital + Salvage value

Accept/reject criterion:

Accept when ARR is above the minimum rate

May accept when the ARR is equal to the minimum rate.

Reject when the ARR is less than the minimum rate.

Eg: the following are the two investment proposals available. Determine their ARR.

	Machine A	Machine B
Cost	56125	58125
Annual estimated income after dep and tax		
I Year	3375	11375
II Year	5375	9375
III Year	7375	7375
IV Year	9375	5375
V Year	11375	3375
Total earnings	36875	36875
Estimated life	5 years	5 years
Estimated salvage value	3000	3000

Machine A

$$\text{Average Earnings} = \frac{36875}{5} = 7375$$

$$\text{Average Investment} = (56,125 - 3000) / 2 + 0 + 3000 = 29562.50$$

$$\text{ARR} = \frac{\text{Annual average net earnings after taxes}}{\text{Average Investment}} \times 100$$

$$= \frac{7375}{29562.50} \times 100 = \underline{24.95\%}$$

Machine B

$$\text{Average earnings} = \frac{36875}{5} = 7375$$

$$\text{Average Investment} = (58125 - 3000) / 2 + 0 + 3000 = 30562.50$$

$$\text{ARR} = \frac{\text{Annual average net earnings after taxes}}{\text{Average Investment}} \times 100$$

$$= \frac{7375}{30562.50} \times 100 = \underline{24.13\%}$$

Machine A would be preferred.

Eg 2.

The following are the information about two machines, which of the machines can be preferred under ARR Method?

Particulars	Machine I	Machine II
Cost of machine	45,000	45,000
Sales per year	1,00,000	80,000
Cost per year	36,000	30,000
Expected life	2 years	3 years
Tax rate	50%	50%

Ascertainment of average annual profit:

Working notes: calculation of depreciation:

Cost of the machine/ expected life

Machine I	Machine II
-----------	------------

$\frac{45000}{2}$	$\frac{45000}{3}$
22500	15,000

Calculation of average investment:

$$AI = \frac{\text{Initial cost}}{2}$$

Machine I

$$AI = \frac{45000}{2} = 22500$$

Machine II

$$AI = \frac{45000}{2} = 22500$$

Calculation of average profits/earnings

Particulars	Machine I	Machine II
Sales per year	1,00,000	80,000
Less: cost of production	36,000	30,000
Profit before dep and tax	64000	50000
Less depreciation	22500	15000
Profit after depreciation but before tax	41500	35000
Less Tax @50%	20750	17500
profit per year after depreciation and tax	20750	17500

Calculation of ARR

$$\text{Machine I: } \frac{20750}{22500} \times 100 = 92.2\%$$

$$\text{Machine II: } \frac{17500}{22500} \times 100 = 77.7\%$$

Merits of ARR method:

1. Considers all the cash flows.
2. Calculation is simple.

Demerits:

1. Ignore time value of money.
2. Takes accounting profits and not the cash flows

3. The calculation of average profits and the average investment differs widely and hence the results may differ.

Discounted payback period method: It is the same as payback period method but the cash flows are taken after discounting or the present values.

Cash flows to be taken for the different calculations:

NPV, IRR, PI ----- cash flows after tax but before depreciation (Present values)

Payback period--- cash flows after tax but before depreciation

ARR- Cash flows after depreciation and tax.

Eg: yes company is considering an investment in a project requiring a capital investment of Rs 2, 00,000. The annual income from the project after depreciation but before tax are as follows:

Year	1	2	3	4	5
income	1,00,000	1,00,000	80,000	80,000	50,000

Company's tax rate is 40% and charges depreciation on original cost.

Ascertain NPV at 15%, PI, Payback period and ARR.

PVf at 15% are, 0.870, 0.756, 0.658, 0.572, 0.497

year	EADBT	TAX	EAT	+Dep	EATBD	PVf	PV
1	1,00,000	40,000	60,000	40,000	100,000	0.870	87000
2	1,00,000	40,000	60,000	40,000	1,00,000	0.756	75600
3	80,000	32,000	48,000	40,000	88,000	0.658	57904
4	80,000	32,000	48,000	40,000	88,000	0.572	50336
5	50,000	20,000	30,000	40,000	70,000	0.497	34790
TOTAL			24,6000		PBP		3,05,630

$$\text{NPV} = 3,05,630 - 2,00,000$$

$$= \underline{1,05,630}$$

$$\text{PI: } 3,05,630 / 200000 = \underline{1.528}$$

$$\text{Payback period: } 1,00,000 + 1,00,000 = 2,00,000$$

Therefore PBP is 2 years

ARR:

$$\text{AI} = 2,00,000 / 2 = 1,00,000$$

$$\text{AATP} = 246000 / 5 = 49200$$

$$= (49200/100000) 100 = \underline{49.2\%}$$

Problem No:2

Compute payback period, ARR, NPV and discounted payback period from the following.

Particulars	Rs
Initial cash outlay	80,000
Estimated life	5 years
Profit after tax	
Year 1	6,000
2	14,000
3	24,000
4	16,000
5	nil

Depreciation is calculated on straight line method. The cost of capital is taken at 20%.

The present value factors are, .83, .69, .58, .48, .40

YEAR	EAT	Dep	EATBD	PVf	PV	Cum PV
1	6,000	16000	22000	0.83	18260	18260
2	14,000	16000	30000	0.69	20700	38960
3	24,000	16000	40000	0.58	23200	62160
4	16,000	16000	32000	0.48	15360	77520
5	0	16000	16000	0.40	6400	83920
TOTAL	60000				83920	

Calculation of dep

$$\text{Cost/life} = 80000/5 = 16,000$$

$$\text{NPV} = 83920 - 80000 = 3920$$

$$\text{PI} = 83920/80000 = 1.049$$

$$\text{PBP} = 22000 + 30000 = 52000$$

$$80000 - 52000 = 28000$$

$$(12/40000)28000 = 8.4 \text{ Months}$$

Therefore PBP= 2years, 8.4 months

$$\text{Discounted PBP} = 18260 + 20700 = 38960 + 23200 = 62160 + 15360$$

$$80000 - 77520 = 2480$$

$$(12/6400)2480 = 4.65 \text{ MONTHS}$$

Therefore discounted PBP= 4 YEARS AND 4.65 MONTHS.

Calculation of IRR:

Eg: A firm is considering two mutually exclusive projects, X and Y. the details are as under.

Particulars	Project X	Project Y
Investment	70,000	70,000
Cash flow		
1	10,000	50,000
2	20,000	40,000
3	30,000	20,000
4	45,000	10,000
5	60,000	10,000

PVFactors at 25% and 30% are,

year	25%	30%
1	0.800	0.769
2	0.640	0.592
3	0.512	0.455
4	0.410	0.350
5	0.328	0.269

Solution: Project X

year	Cash flows	PVf @25%	PV (2X3)	PVf @ 30%	PV (2X5)
1	10,000	0.800	8,000	0.769	7,690
2	20,000	0.640	12,800	0.592	11,840
3	30,000	0.512	15,360	0.455	13,650
4	45,000	0.410	18,450	0.350	15,750
5	60,000	0.328	19,680	0.269	16,140
Total			74,290		65,070
Less P			70,000		70,000
NPV			4,290		-4930

$$IRR = LTR + \frac{NPV \text{ at } LTR}{NPV \text{ at } LTR - \text{at } HTR} \times \text{Difference between trial rates}$$

$$= 25 + \frac{4290}{4290 - (-4930)} \times (30 - 25)$$

$$25 + \frac{4290}{4290 + 4930} \times (5)$$

$$25 + \frac{4290}{9220} \times (5)$$

$$25 + 0.4252 \times (5) = 25 + 2.126 = \underline{27.126\%}$$

Solution: Project Y

year	Cash flows	PVf @25%	PV (2x3)	PVf @ 30%	PV
1	50,000	0.800	40,000	0.769	38,450
2	40,000	0.640	25,600	0.592	23,680
3	20,000	0.512	10,240	0.455	9,100
4	10,000	0.410	4,100	0.350	3,500
5	10,000	0.328	3,280	0.269	2,690
Total			83,220		77,420
Less P			70,000		70,000
NPV			13,220		7,420

$$IRR = LTR + \frac{NPV \text{ at LTR}}{NPV \text{ at LTR} - \text{at HTR}} \times \text{Difference between trial rates}$$

$$= 25 + \frac{13,220}{13,220 - 7420} \times (30 - 25)$$

$$25 + \frac{13,220}{5,800} \times (5) = 25 + (2.2793 \times 5) = 25 + 11.3965 = \underline{36.3965\%}$$

Therefore project Y is preferred.

Eg: 2 Home work

Calculate NPV at 20%, IRR and PI at 20% from the following

Year	Project A	Project B
1	15,000	5,000
2	20,000	15,000
3	25,000	20,000
4	15,000	30,000
5	10,000	20,000
Cost of the project	60,0000	60,000

Pv factors at 20% and 35% are,

0.833, 0.694, 0.579, 0.482, 0.402

0.741, 0.549, 0.406, 0.301, 0.226