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- Teaching Financial Accounting , Financial Management & Strategic Management to CA Students For 12 Years.
- Practicing Chartered Accountant For Past 13 years in The Field of Audit , Direct & Indirect Taxes & Management Consultancy
- Elected as Convenor of The Jalna CA CPE Chapter of WIRC of ICAI For 2 consecutive years 20-21 & 21-22.
- He Has Successfully Completed & Qualified Following Certificate Course Conducted By ICAI

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3. Goods & Service Tax (GST)
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5. Drafting & Pleading Before Authorities
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CA TUSHAR TAPARIA

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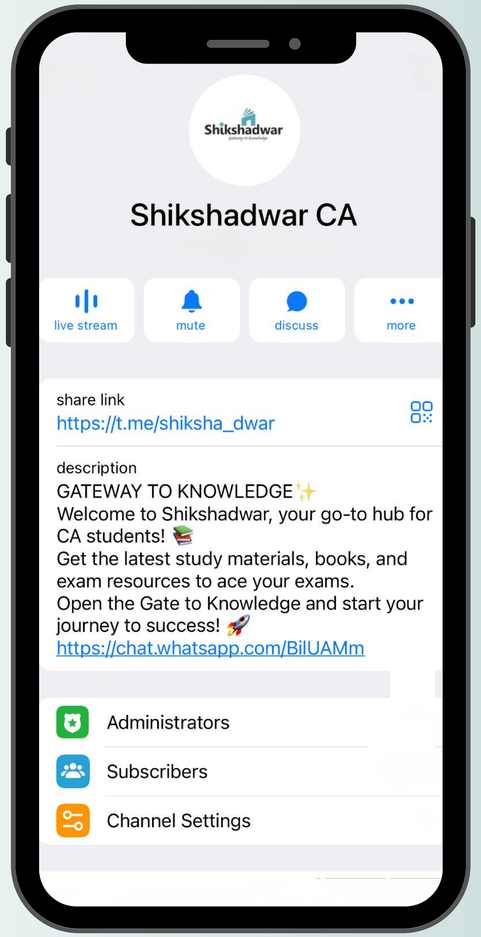

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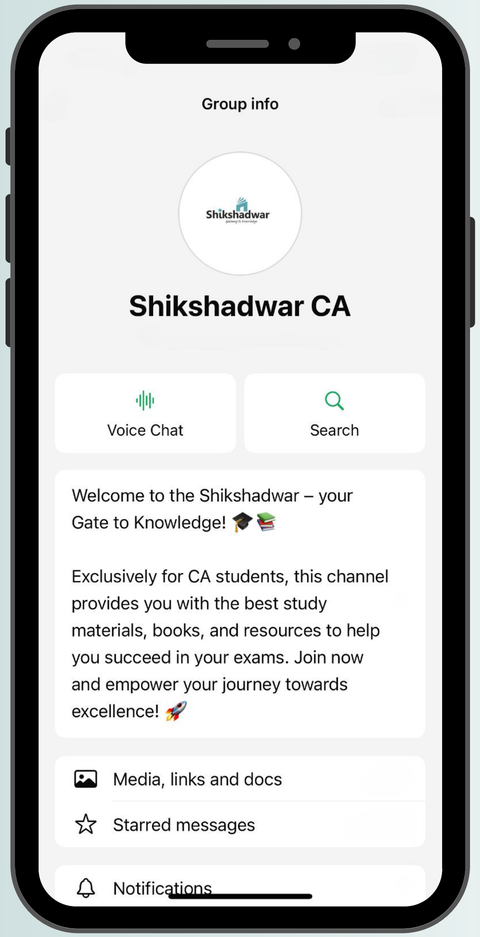

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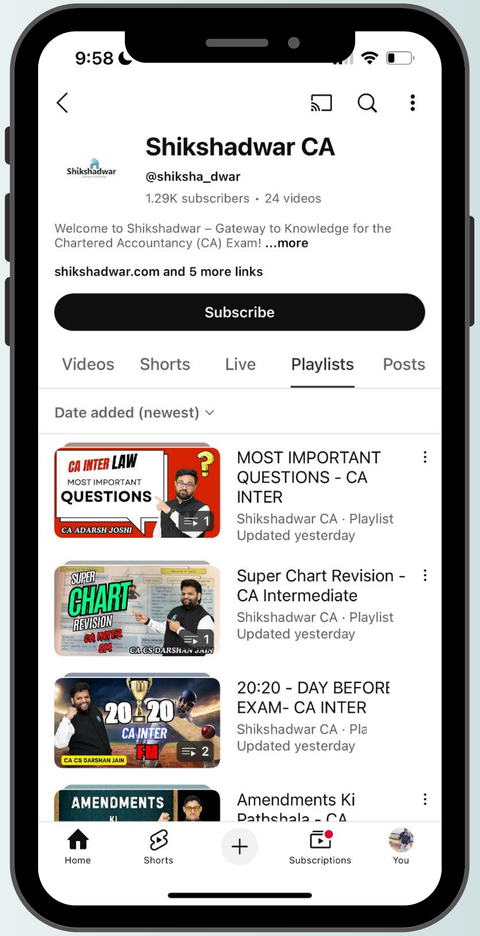

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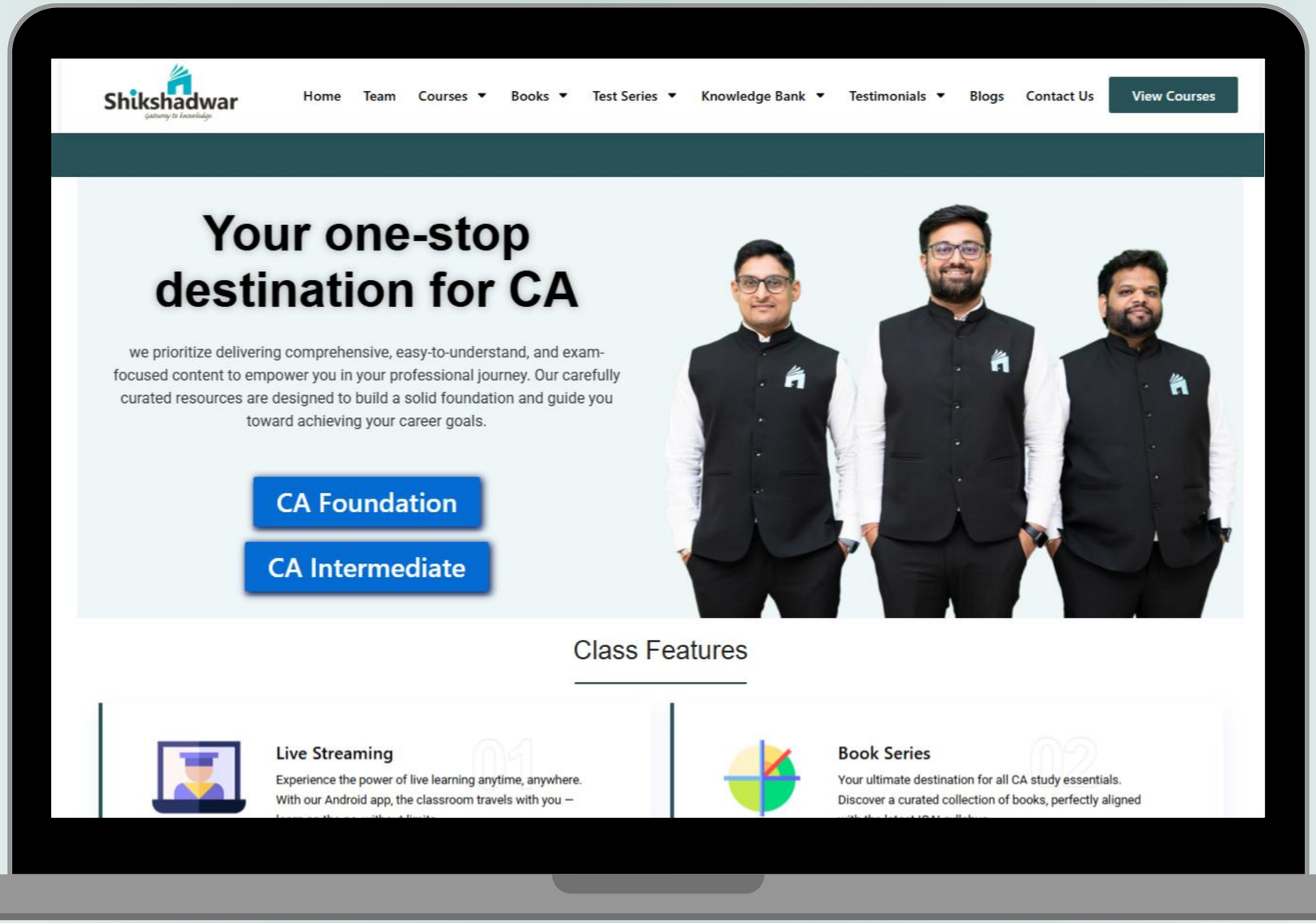

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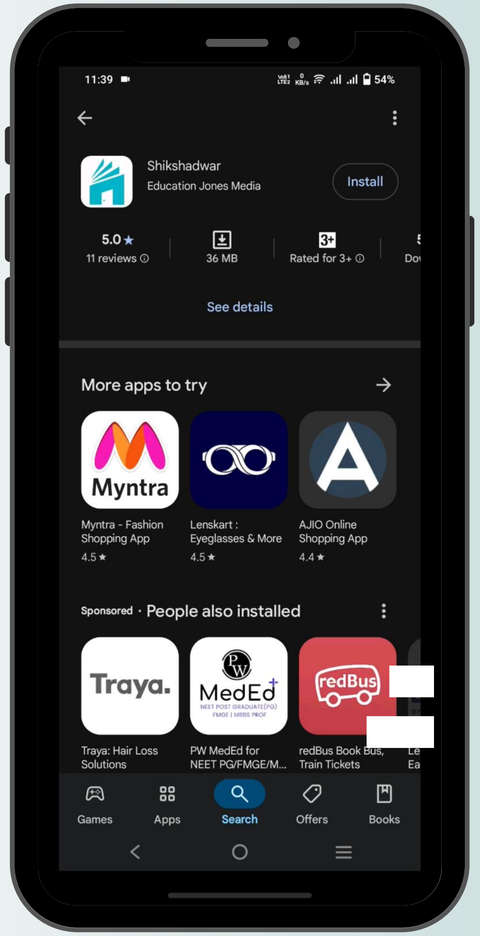

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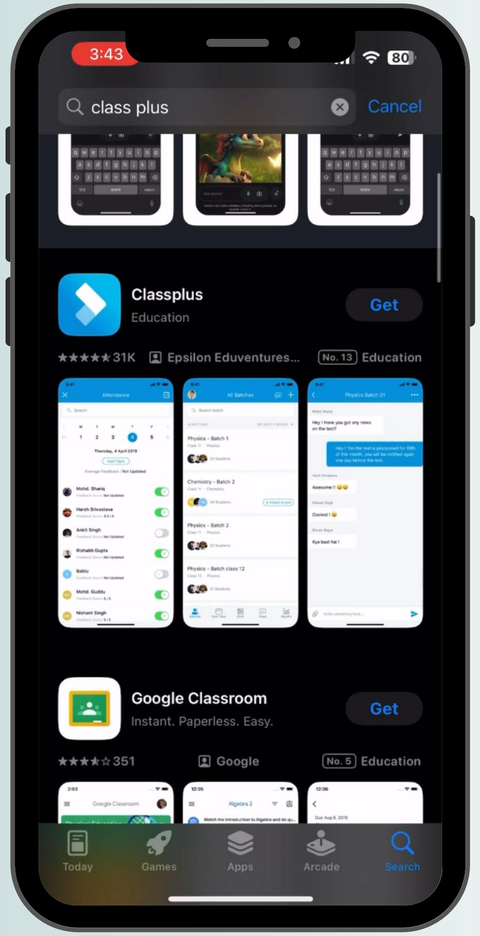

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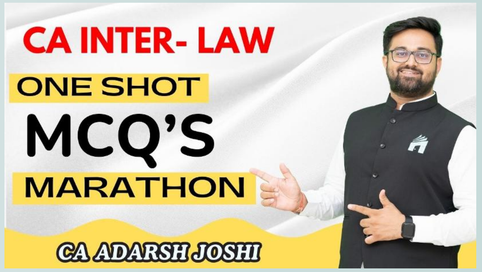
CA INTERMEDIATE MAY 25

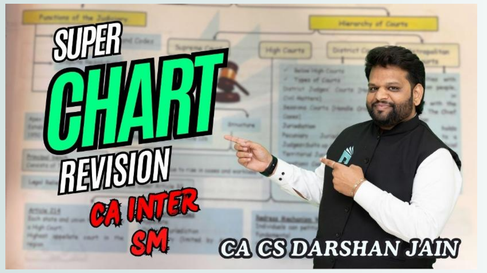
Marathons Live Streams

RRR - Result Oriented Rapid Revision

Most Imp Questions



One Shot MCQ's Marathon



Super Chart Revision

Amendments Ki Pathshala

20 -20 Series

CA INTERMEDIATE MAY 25

Marathons Schedule With Links

DATE	TIME	EDUCATOR	SUBJECT	TOPICS	YOUTUBE LINK
17/4/2025	8.00 AM	CA ADARSH JOSHI	LAW	RRR	WATCH NOW
18/4/2025	12.00 NOON	CA TUSHAR TAPARIA	GST	RRR	WATCH NOW
19/4/2025	8.00 AM	CA CS DARSHAN JAIN	FM	RRR	WATCH NOW
20/4/2025	8.00 AM	CA ADARSH JOSHI	LAW	ONE SHOT MCQ MARATHON	WATCH NOW
21/4/2025	2.00 PM	CA TUSHAR TAPARIA	GST	GST AMENDMENTS & ITS IMPORTANT QUESTIONS	WATCH NOW
23/4/2025	8.00 AM	CA CS DARSHAN JAIN	FM	ONE SHOT MCQ MARATHON	WATCH NOW

DATE	TIME	EDUCATOR	SUBJECT	TOPICS	YOUTUBE LINK
24/4/2025	2.00 PM	CA TUSHAR TAPARIA	DT	DT AMENDMENTS & ITS IMPORTANT QUESTIONS	
27/4/2025	8.00 AM	CA CS DARSHAN JAIN	SM	ONE SHOT MCQ MARATHON	
4/5/2025	8.00 AM	CA ADARSH JOSHI	LAW	MOST IMPORTANT QUESTIONS	
6/5/2025	3.00 PM	CA TUSHAR TAPARIA	TAXATION	20-20	
12/5/2025	8.00 AM	CA CS DARSHAN JAIN	FM	20-20	
13/5/2025	8.00 AM	CA CS DARSHAN JAIN	SM	SUPER CHART REVISION	

CAPITAL BUDGETING

WEIGHTAGE ANALYSIS

SR.NO	NAME OF TOPIC	May 18	Nov 18	May 19	Nov 19	Nov 20	Jan 21	Jul 21	Dec 21	May 22	Nov 22	May 23	Nov 23
1	MEANING , SCOPE AND OBJECTIVES OF FM	4	2		3	4	4	2	2	2	2		4
2	TYPES OF FINANCING	6	8	6	4	4	2	4	4	2	4	6	8
3	LEVERAGE ANALYSIS	5	10	10	10	12	10	10	10	10	10	7	5
4	COST OF CAPITAL		10	5	14	5	10	10	5	10	11	10	10
5	CAPITAL STRUCTURE	10	5	10		10	10	5	10	10	6	10	10
6	CAPITAL BUDGETING	28	10	15	20	5	12	12	2	14	20	10	10
7	RISK ANALYSIS IN CAPITAL BUDGETING	4	7	6	3	12	5	5	14	5	5	5	5

SR.NO	NAME OF TOPIC	May 18	Nov 18	May 19	Nov 19	Nov 20	Jan 21	Jul 21	Dec 21	May 22	Nov 22	May 23	Nov 23
8	ESTIMATION & FINANCING OF WORKING CAPITAL	10		10		10	5			5		4	5
9	MANAGEMENT OF ACCOUNT RECIEVABLES		10					9	5			5	
10	MANAGEMENT OF CASH & MARKETABLE SECURITIES				10		4		5		9		
11	MANAGAMENT OF PAYABLES												
12	MANAGEMENT OF INVENTORY									5			
13	DIVIDEND DECISION		5	5	5	5	5	5	5	4		5	10
14	RATIO ANALYSIS	5	5	5	5	5	5	10	10	5	5	10	5
	TOTAL	72	72	72	74	72	72	72	72	72	72	72	72

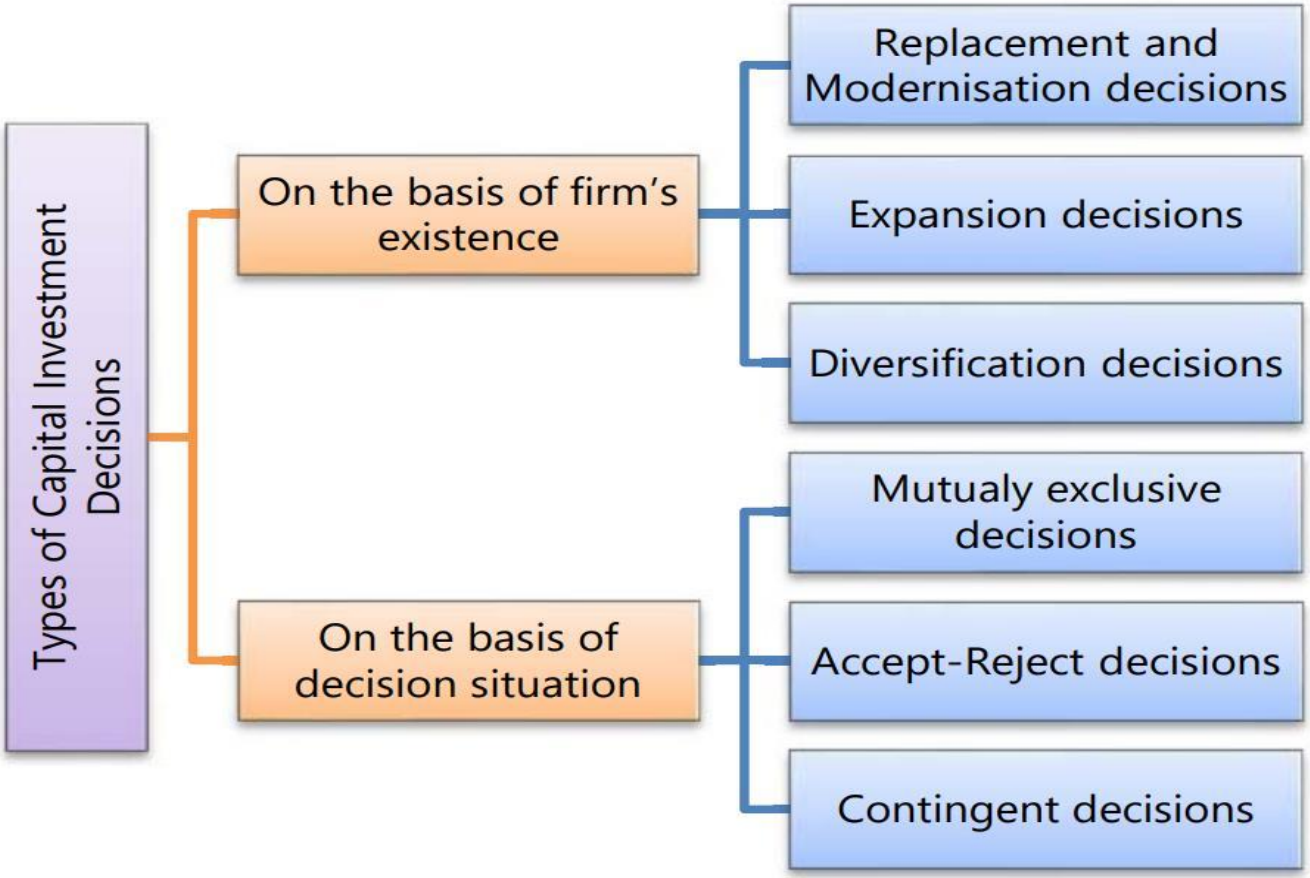
BIRDS EYE VIEW

- Introduction.
- Concept Of Capital Budgeting
- Importance Of Capital Budgeting Decisions
- Capital Budgeting Process
- Type Of Investment Proposals
- Basic Factors For Project Evaluation
- Determination Of Initial Cash Flows , Interim Cash Flows & Terminal Cash Flows
- **Techniques Of Capital Budgeting** - Payback Period, Payback Reciprocal, Accounting Rate Of Return Method , NPV Method , Profitability Index Method, Internal Rate Of Return Method , Discounted Payback Period, Modified Internal Rate Of Return
- NPV V/S IRR
- Projects With Varying Lives
- Capital Rationing
- Summary

CONCEPT OF CAPITAL BUDGETING

1. Capital budgeting refers to the long term planning of expenditure whose returns stretch over future period
2. It is the process of deciding whether or not to commit resources to a project whose benefits would be spread over several time periods.
3. It considers proposed capital outlay and it's financing. Thus it includes both raising of long term funds as well as their utilization.
4. The exercise involved in a capital budgeting is to co-relate the benefits to costs in some reasonable manner that would be consistent with the profit maximizing objectives of the business.
5. It is a managerial decision, since it involves more extended estimation and prediction of things to come requiring high order of intellectual ability.
6. The economic justification for a capital expenditure programme requires a long term estimates of profits, which in turn involves projection of sales and costs of operation over a period of years.

TYPES OF INVESTMENT PROPOSAL



(i) **Replacement and Modernisation decisions:** The replacement and modernisation decisions aims to improve operating efficiency and reduce cost. Generally, all types of plant and machinery require replacement either because the economic life of the plant or machinery is over or because it has become technologically outdated. The former decision is known as replacement decision and latter is known as modernisation decision. Both replacement and modernisation decisions are called as cost reduction decisions.

(ii) **Expansion decisions:** Existing successful firms may experience growth in demand of their product line. If such firms experience shortage or delay in the delivery of their products due to inadequate production facilities, they may consider proposal to add capacity to existing product line.

(iii) **Diversification decisions:** These decisions require evaluation of proposals to diversify into new product lines, new markets etc. for reducing the risk of failure by dealing in different products or by operating in several markets.

Both expansion and diversification decisions are called revenue expansion decisions.

(i) **Mutually exclusive decisions:** The decisions are said to be mutually exclusive if two or more alternative proposals are such that the **acceptance of one proposal** will exclude the acceptance of the other alternative proposals. For instance, a firm may be considering proposal to install a semi-automatic or highly automatic machine. If the firm installs a semi-automatic machine, it excludes the acceptance of proposal to install highly automatic machine.

(ii) **Accept-Reject decisions:** The accept-reject decisions occur when **proposals are independent** and do not compete with each other. The firm may accept or reject a proposal on the basis of a minimum return on the required investment. All those proposals which give a higher return than certain desired rate of return are accepted and the rest are rejected.

(iii) **Contingent decisions:** The contingent decisions are made when the proposals are **dependable** proposals. The investment in one proposal requires investment in one or more other proposals. For example, if a company accepts a proposal to set up a factory in remote area, it will have to invest in infrastructure, like building of roads, houses for employees etc. also.

BASIC FACTORS FOR PROJECT EVALUATION

1. **Initial investment -** This equals the cash outflow at the initial stage , net of salvage value of old machinery if any. Initial Investment = Cost of new Asset purchased less sale value of old Asset if any.

2. **Cash flow after taxes (CFAT) -** This equals the cash inflows generated by the projects at various points of time. Generally CFAT = PAT(profit after Tax) + Depreciation and other amortization's.

3. **Terminal Inflows –** At the end of the project, there may be terminal inflows like Recovery of Working Capital investment in the project, Salvage value of fixed assets etc.

4. **Project life -** The time period during which the project generates positive cash flow after taxes is called project life.

5. **Time value of money -** The value of money differs at different point of time. So the present value of future cash flows will be computed by discounting the same at the appropriate discount rate.

6. **Discount rate -** It represents the cut-off rate for capital investment evaluation. A project which does not earn at least the cut-off rate should not be accepted. Generally, the rate used for discounting is the weighted average cost of capital of the enterprise.

7. **PV factor and annuity factor tables -** For the purpose of discounting future cash flows, the PV factor (present value factor) and annuity factor tables are used. The utility of tables is as under:

   a) In case of uniform cash flows during the project life - annuity factor For the project life.

   b) In case of differential cash flows during the project life - PV factors for each year.

CASH FLOWS

Before we analyze how cash flow is computed in capital budgeting decision, following items needs consideration:

a) **Depreciation:** As mentioned earlier, depreciation is a **non-cash item** and itself does not affect the cash flow. However, we must consider tax shield or benefits from depreciation in our analysis. Since this benefit reduces cash outflow for taxes **it is considered as cash inflow.**

b) **Opportunity Cost:** Opportunity cost is foregoing of a benefit due to choosing an alternative investment option. For example, if a company owns a piece of land acquired 10 years ago for Rs.1 crore can be sold for 10 crore. If the company uses this piece of land for a project, then its sale value i.e. Rs.10 crore forms the part of initial outlay as by using the land the company has foregone Rs.10 crore which could be earned by selling it. This opportunity cost can occur both at the time of initial outlay and during the tenure of the project. Opportunity costs are considered for estimation of cash outflows.

c) **Sunk Cost:** Sunk cost is an outlay of cash that has **already been incurred** in the past and cannot be reversed in present. Therefore, these costs do not have any impact on decision making, hence should be excluded from capital budgeting analysis. For example, if a company has paid a sum of 1,00,000 for consultancy fees to a firm to prepare a Project Report for analysing a particular project. Then the consultancy fee paid is irrelevant and is not considered for estimating cash flows as it has already been paid and shall not affect our decision whether project should be undertaken or not.

d) **Working Capital:** Every big project requires working capital because, for every business, investment in working capital is must. Therefore, while evaluating the projects, **initial working capital requirement** should be treated as **cash outflow and at the end of the project its release should be treated as cash inflow.** It is important to note that no depreciation is provided on working capital though it might be possible that at the time of its release its value might have been reduced. Further there may be also a possibility that additional working capital may be required during the life of the project. In such cases the additional working capital required is treated as cash outflow at that period of time. Similarly, any reduction in working capital shall be treated as cash inflow. It may be noted that, if nothing has been specifically mentioned for the release of working capital it is assumed that full amount has been realized at the end of the project. However, adjustment on account of increase or decrease in working capital needs to be incorporated.

e) **Allocated Overheads:** As discussed in the subject of Cost and Management Accounting, allocated overheads are charged on the basis of some **rational basis** such as machine hour, labour hour, direct material consumption etc. Since, expenditures already incurred are allocated to new proposal, they should not be considered as cash flows. However, if it is expected that overhead cost shall increase due to acceptance of any proposal then incremental overhead cost shall be treated as cash outflow.

f) **Additional Capital Investment:** It is not necessary that capital investment shall be required in the beginning of the project. It can also be required during the continuance of the project. In such cases, it shall be treated as cash outflows at that period of time.

INITITAL CASH FLOWS

PARTICULARS	Rs.
Cost of New Asset	XXX
Add - Installation/Set up costs	XXX
Add/Less - Increase (Decrease) in Working capital level	XXX
Less - Net proceeds after capital gain tax from sale of old Asset (If it is a replacement situation)	XXX
Less - Subsidy received from Government if any	XXX
Initial Cash Outflow	XXX

INTERIM CASH FLOWS - CFAT

PARTICULARS	Rs.
Operating Revenue i.e. Sales	XXX
Less - Cash Operating Expenses variable costs + cash fixed cost (excluding depreciation)	XXX
Cash inflow before taxes	XXX
Less – Depreciation	XXX
Profit before tax (PBT)	XXX
Less - Amount of income tax	XXX
Profit after tax (PAT)	XXX
Add – Depreciation	XXX
Cash flows after tax (CFAT)	XXX

CFAT – IMPORTANT POINTS

1. Depreciation is calculated on cost of asset after deduction of amount of subsidy received if any.

2. If there is loss in any year such loss may be either carried forward or set off in the same year .If it is carried forward then tax paid would be zero. If it is set off in the same year against any other existing income then we will consider tax saving in the above statement.

3. Interest / preference dividend is not to be deducted because it is financial cost and it is considered in the weighted average cost of capital i.e. discount rate.

TERMINAL CASH FLOWS

PARTICULARS	Rs.
Final salvage value (disposal value) of asset after capital gain	XXX
Add : Release of net working capital	XXX
Terminal year net cash flow (cash flow at the end)	XXX

1. Capital gain/loss from depreciable asset is short term capital gain/loss as per Sec 50 of Income Tax Act.

2. If nothing is given assume that amount of working capital is recovered completely (100%) at the end of project life and write note to that effect.

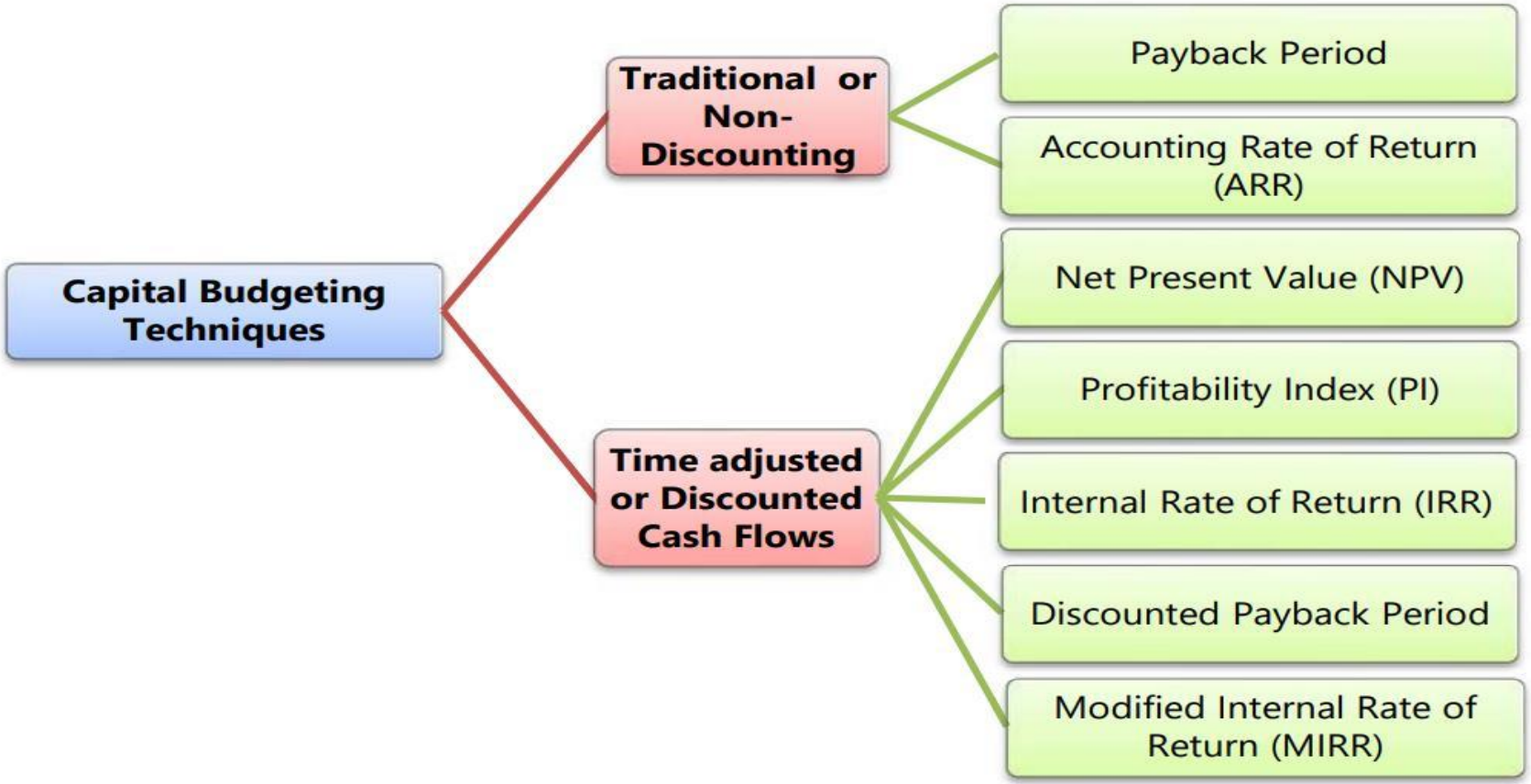
ILLUSTRATION 1

ABC Ltd is evaluating the purchase of a new machinery with a depreciable base of ₹ 1,00,000; expected economic life of 4 years and change in earnings before taxes and depreciation of ₹ 45,000 in year 1, ₹ 30,000 in year 2, ₹ 25,000 in year 3 and ₹ 35,000 in year 4. Assume straight-line depreciation and a 20% tax rate. You are required to COMPUTE relevant cash flows.

Statement Showing Computation of CFAT

Sr. No.	Particulars	Year 1	Year 2	Year 3	Year 4
A	Earning Before Tax and Depreciation	45,000	30,000	25,000	35,000
B	Less : Depreciation	25,000	25,000	25,000	25,000
C	Earning Before Tax (A-B)	20,000	5,000	0	10,000
D	Less : Tax @20%	4000	1000	0	2000
E	EAT (C-D)	16,000	4,000	0	8,000
F	Add : Depreciation	25,000	25,000	25,000	25,000
G	CFAT (E+F)	41,000	29,000	25,000	33,000

TECHNIQUES OF CAPITAL BUDGETING



PAYBACK PERIOD

CONCEPT

Payback period refers to the period in which the project will generate the necessary cash to recoup the initial investment.

Formula -

a) **When the Annual Expected Cash Flow After taxes are uniform over the useful life of the project**

$$\text{Payback period} = \frac{\text{total initial capital investment}}{\text{annul expected Cash Flow After Taxes}}$$

a) **When the Annual Expected Cash Flow After taxes are not uniform over the useful life of the project**

The cumulative CFAT is to be calculated until the total is equal to the initial capital investment the period in which cumulative CFAT is equal to initial outlay it is known as payback period.

EXAMPLE

Suppose A Project Costs Rs. 20,00,000 & yields Annually a profit of Rs. 3,00,000 after depreciation at 12.50% (SLM) But Before taxes at 50%. Calculate Payback Period

Statement Showing CFAT

SR.NO	PARTICULARS	Rs.
A	Profit after depreciation & Before Tax	300000
B	Less- Tax @ 50%.	150000
C	Profit after Tax (A-B)	150000
D	Add- Depreciation (2000000 x 12.50%)	250000
E	CFAT (C+D)	400000

Payback Period = $\frac{\text{Investment}}{\text{Annual CFAT}}$

$= \frac{2000000}{400000} = 5$ years.

Statement Showing CFAT

SR.NO	PARTICULARS	Rs.

EXAMPLE

XYZ Ltd is Analyzing A Project Requiring an initial cash Outlay of 2,00,000 and is Expected to generate Cash Flows as Follows -

Year	Annual Cash Inflows (₹)
1	80,000
2	60,000
3	60,000
4	20,000

Calculate Payback Period

Statement Showing Cumulative Cash Flow

Year	Annual cash Flow	Cumulative Cash Flow

Statement Showing Cumulative Cash Flow

Year	Annual cash Flow	Cumulative Cash Flow
1	80000	80000
2	60000	140000
3	60000	200000

Pay back Period = 3 Years.

EXAMPLE

XYZ Ltd is Analyzing A Project Requiring an initial cash Outlay of 2,05,000 and is Expected to generate Cash Flows as Follows -

Year	Annual Cash Inflows (₹)
1	80,000
2	60,000
3	60,000
4	20,000

Calculate Payback Period

Statement Showing Cumulative Cash Flows

YEAR	ANNUAL CASH INFLOWS	CUMULATIVE CASH FLOWS

Statement Showing Cumulative Cash Flows

YEAR	ANNUAL CASH INFLOWS	CUMULATIVE CASH FLOWS
1	80 000	80 000
2	60 000	140 000
3	60 000	200 000
4	20 000	220 000

Payback Period = 3 years + $\frac{5\,000}{20\,000}$

= 3.25 years

PAYBACK RECIPROCAL

It is reciprocal of payback period, it is calculated as follows -

$$= \frac{\text{annual cash inflow}}{\text{intiial investment}} \text{ X } 100$$

Payback period method does not indicate any cut off period for the purpose of investment decision. The reciprocal of payback is a close approximation of the internal rate of return.

EXAMPLE

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.

Calculate Payback Reciprocal

ACCOUNTING RATE OF RETURN (ARR)

CONCEPT

According to this method, the capital investment proposals are judged on the basis of their relative profitability. For this purpose, capital employed and expected income are determined according to commonly accepted accounting principles and practices over the entire economic life of the project and then the average yield is calculated. Such a rate is termed as accounting rate of return.

Formula

$$\text{Accounting rate of return} = \frac{\text{average annual net income}}{\text{investment}}$$

Terms used

1. Average annual net income = accounting profit after tax and depreciation
2. The denominator can be either the initial investment or the average investment over the useful life of the project.

$$\text{Average investment} = \left[\frac{\text{original investment} - \text{scrap value}}{2}\right] + \text{additional working capital} + \text{scrap value}$$

ILLUSTRATION 2

A project requiring an investment of ₹ 10,00,000 and it yields profit after tax and depreciation which is as follows:

Years	Profit after tax and depreciation (₹)
1	50,000
2	75,000
3	1,25,000
4	1,30,000
5	80,000
Total	4,60,000

Suppose further that at the end of the 5th year, the plant and machinery of the project can be sold for ₹ 80,000. DETERMINE Average Rate of Return.

$$ARR = \frac{\text{Average Annual Profit}}{\text{Average Investment}} \times 100$$

$$= \frac{(460000/5)}{\frac{\text{Cost} - SV}{2} + \text{WC} + SV} \times 100$$

$$= \frac{92000}{\frac{1000000 - 80000}{2} + 80000} \times 100$$

$$= 92000/540000 \times 100 = 17.04\%$$

NET PRESENT VALUE

NET PRESENT VALUE

An investment is essential outlay of funds in anticipation of future returns. The presence of time as a factor in investment is fundamental rather than incidental for the purpose of evaluation of investments.

Time is always crucial for the investor, so that a sum received today is worth more than the same sum to be received tomorrow. Thus in evaluating investment projects, it is important to consider the timing of return on investment.

Assumptions of discounting table

1. Opportunity for investment is available at any time for any amount
2. Interest will accrue at the same rate
3. Interest will be received at the end of the year
4. Interest will be reinvested at the same opportunity rate
5. Price level remains the same.

The net present value is the difference between present value of benefits and present value of costs. If the net present value is positive the conclusion is favorable to the decision to go ahead with the project but if it is negative, the project is rejected. The analyst who uses this method feels that it gives desired indication with the least confusion.

Formula

NPV = PV of cash inflow – PV of cash outflow

YEAR	CASH FLOW	DISCOUNTING FACTOR AT….%	DISCOUNTED CASH FLOW

IMPORTANT TERMS

a) Cash outflows - generally, cash outflows consist of (a) initial investment which occurs at time "O" and (b) special payments and outflows e.g. working capital outflow which arises in the year of commercial production Tax paid on capital gain made by sale of old assets, if any.

b) Cash inflows - cash flows = CFAT = PAT + depreciation. Also specific cash inflows like salvage value of new assets and recovery of working capital at the end of the project tax savings on loss due to sale of old asset, should be carefully considered. The general assumption is that all cash inflows occur at the end of each year.

c) Discounting cash inflow and outflows - each item of cash inflows and outflows is discounted to ascertain its present value. For this purpose the discounting rate generally taken as the cost of capital. The present value tables are used to calculate the present value of various cash flows.

d) Use of discounting rate - instead of using the PV factor tables, the relevant discount factor can be computed as

$$= \frac{1}{(1+K)n}$$

Where, k = cost of capital, N = year in which the inflow or outflow takes place

Hence, PV factor at 10% after one year = 1/1.10 = 0.9091

Similarly, PV factor at the end of two years = 1 / (1.10)2 = 0.8264 and so on

IMPORTANT POINTS

1. If there is only proposal it would be selected if NPV is zero or positive, in case of mutually exclusive proposal, the proposal having highest NPV would be selected for implementation.

2. NPV indicates value addition to the wealth of company

3. NPV is calculated by discounting cash flows at discount rate which is equal to cost of capital

4. If NPV is positive, it means that project is expected to earn more than the expectations of Investors.

5. In case of annuity of cash flows, the annuity factor would be written in the discounting factor column.

6. If some cash flows are given at the beginning of some year, then take the discounting factor of the previous year. Eg for cash flows taking place at the beginning of 3^{rd} year discounting factor of 2^{nd} year would be applied.

7. Discounting factor is one for initial investment.

8. Please remember the terminal cash flows i.e. sale value of asset and recovery of working capital.

ILLUSTRATION 3

COMPUTE the net present value for a project with a net investment of ₹ 1,00,000 and net cash flows for year one is ₹ 55,000; for year two is ₹ 80,000 and for year three is ₹ 15,000. Further, the company's cost of capital is 10%.

[PVIF @ 10% for three years are 0.909, 0.826 and 0.751]

Statement Showing NPV of the Project

YEAR	CASH FLOW	PRESENT VALUE FACTOR AT 10%	DISCOUNTED CASH FLOW
0	-1,00,000	1.00	-1,00,000
1	55,000	0.909	49,995
2	80,000	0.826	66,080
3	15,000	0.751	11,265
NPV			**27,340**

Conclusion :- As the NPV is Positive, The Project will be Accepted.

ILLUSTRATION 4

Cello Limited is considering buying a new machine which would have a useful economic life of five years, a cost of ₹ 1,25,000 and a scrap value of ₹ 30,000, 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 50,000 units per annum of a new product with an estimated selling price of ₹ 3 per unit. Direct costs would be ₹ 1.75 per unit and annual fixed costs, including depreciation calculated on a straight- line basis, would be ₹ 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 ₹ 10,000 and ₹ 15,000 respectively.

CALCULATE NPV of the project for investment appraisal, assuming that the company's cost of capital is 10 percent.

Statement Showing NPV of the Project

YEAR	PARTICULARS	CASH FLOW	PRESENT VALUE FACTOR AT 10%	DISCOUNTED CASH FLOW
0	80% Project Cost	-100,000	1.00	-100,000
1	20% Project Cost	-25,000	0.909	-22,725
1	CFAT	31,500	0.909	28,634
2	CFAT	26,500	0.826	21,889
3	CFAT	41,500	0.751	31,167
4	CFAT	41,500	0.683	28,345
5	CFAT	41,500	0.621	25,772
5	Scrap value	30,000	0.621	18,630
NPV				**31712**

Conclusion :- As the NPV is Positive, The Project will be Accepted.

WN 1 Statement Showing CFAT

SR.NO	PARTICULARS	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
A	Total Contribution 50000 * (3-1.75)	62,500	62,500	62,500	62,500	62,500
B	Fixed Cost Excluding Depreciation	21,000	21,000	21,000	21,000	21,000
C	Sales Promotion Expenses	10,000	15,000	-	-	-
D	CFAT (A-B-C)	31,500	26,500	41,500	41,500	41,500

WN 2 Ascertainment of Fixed Cost Excluding Depreciation

Total Fixed Cost = Depreciation + Other Fixed Cost

40000 = (125000 - 30000 / 5) + Other Fixed Cost

40000 = 19000 + Other Fixed Cost

Other Fixed Cost = 21000

ILLUSTRATION 5 (PYP NOV 2020) 5 MARKS

CK Ltd. is planning to buy a new machine. Details of which are as follows:

Cost of the Machine at the commencement	*₹ 2,50,000*
Economic Life of the Machine	*8 year*
Residual Value	*Nil*
Annual Production Capacity of the Machine	*1,00,000 units*
Estimated Selling Price per unit	*₹ 6*
Estimated Variable Cost per unit	*₹ 3*
Estimated Annual Fixed Cost (Excluding depreciation)	*₹ 1,00,000*

Advertisement Expenses in 1st year in addition of annual fixed cost ₹ 20,000

Maintenance Expenses in 5th year in addition of annual fixed cost ₹ 30,000

Cost of Capital 12%

Ignore Tax.

Analyse the above mentioned proposal using the Net Present Value Method and advice.

P.V. factor @ 12% are as under:

Year	1	2	3	4	5	6	7	8
PV Factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

STATEMENT SHOWING NPV				
YEAR	PARTICULARS	CASH FLOW	PVF AT 12%	DCF
0	INITIAL CASH OUTFLOW	(250000)	1.00	(250000)
1	ADVERTISEMENT EXPENSES	(20000)	0.893	(17860)
5	MAINTAINANCE EXP	(30000)	0.567	(17010)
1-8	ANNUAL CFAT	200000	4.968	993600
			NPV	708730

Advise: CK Ltd. should buy the new machine, as the net present value of the proposal is positive i.e ₹ 7,08,730.

WN 1 - CALCULATION OF ANNUAL CFAT

SR.NO	PARTICULARS	AMOUNT
A	Units Sold	100000
B	Contribution [(6-3) *A]	300000
C	Less – Fixed Cost	100000
D	Annual CFAT (B-C)	200000

PROFITABILITY INDEX/DESIRABILITY FACTOR

CONCEPT

If the present value method is used, the present value of the earrings of one project cannot be compared directly with the present value of earnings of another, unless the investment are of the same size. In order to compare proposals of different size, the cash inflows must be related to Initial Investment. This is done by dividing the present value of earnings by the amount of investment, to give a ratio i.e. called the profitability index / ratio or desirability factor.

Formula

$$\text{Profitability index} = \frac{\text{discounted cash inflow}}{\text{discounted cash outflow}}$$

OR

$$\text{Profitability ratio} = \frac{\text{discounted cash inflow}}{\text{discounted cash outflow}} \text{x} 100$$

IMPORTANT POINTS

1. If NPV is positive , PI is greater than one

2. PI is used when projects involving different cash outflow are to be compared

3. PI indicates amount of cash inflow for every one rupee of cash outflow

4. If cash outflow takes place at multiple points of time then total of all cash outflow is required to be taken.

5. PI is calculated by discounting cash flow at discount rate which is equal to cost of capital.

ILLUSTRATION 6

Suppose we have three projects involving discounted cash outflow of ₹ 5,50,000, ₹ 75,000 and ₹ 1,00,20,000 respectively. Suppose further that the sum of discounted cash inflows for these projects are ₹6,50,000, ₹95,000 and ₹1,00,30,000 respectively. CALCULATE the desirability factors for the three projects.

1) Desirability Factor = 6,50,000 / 5,50,000 = 1.18

2) Desirability Factor = 95,000 / 75,000 = 1.27

3) Desirability Factor = 1,00,30,000 / 1,00,20,000 = 1.00

INTERNAL RATE OF RETURN (IRR)

CONCEPT

In the net present value method the required earnings rate is selected in advance. There is an alternative method which finds the earnings rate at which the present value of the earnings equals the amount of the investments. This rate is called the time – adjusted rate of return. DCF rate of return, internal rate of return, yield rate, marginal efficiency of capital etc. IRR is the rate which brings the sum of the future cash flows to the same level as the original investment. **Thus IRR is the rate of return at which the sum of discounted cash inflows equals the sum of discounted cash outflows.**

Formula

The IRR is calculated under two situations –

1. When cash flow are uniform
2. When cash flows are not uniform

WHEN CASH FLOWS ARE UNIFORM

In case of those projects which generate uniform cash inflows, the IRR can be calculated by locating the factor in annuity table II

Steps for calculation of IRR

1. Divide the investment by the annual cash inflow. The result is called the 'Factor' or Payback'.

2. Go across the row of the year (equivalent to the project) of table II and check up the closed figures to the fact (as determined in step (1) above) and ascertain the rate.

3. If IRR is greater or equal to minimum desired rate of return accept the project, if IRR is less than minimum desired rate of return reject the project.

WHEN CASH FLOWS ARE NOT UNIFORM

The IRR can be found out by trial calculations. The cash flows of project for each year and its residual value are listed and various discount rates are applied to these amounts until closest rate is found that makes their total present value equal to the amount of investment. The indication for discounting at higher or lower rate can be considered on the following basis.

With the discounting rate (where there is positive NPV i.e. start rate and negative NPV i.e. end rate) IRR is obtained by interpolation as under –

$$\textbf{IRR = Start Rate+ } \frac{\textit{Surplus at Start Rate}}{\textit{Surplus at Start rate} - \textit{Deficit at End Rate}} (\textit{Difference Between Rates})$$

Under this method it is presumed that cash flows can be reinvested at internal rate of return. IRR calculations are based upon the investment rate assumptions i.e. IRR method assume reinvestment at IRR.

IMPORTANT POINTS

1. Unlike the net present value method, the internal rate of return method does not use the cost of capital at discount rate but calculates discount rate which makes NPV as zero.

2. If IRR is more than cost of capital then project is accepted and vice-versa.

3. This IRR is compared with organization's desired rate of return of evaluating capital investments.

IRR assumes that the intermediate cash flows received during the continuance of the project are reinvested at the IRR itself. This assumption is not practical

ILLUSTRATION 7

A Ltd. is evaluating a project involving an outlay of ₹ 10,00,000 resulting in an annual cash inflow of ₹ 2,50,000 for 6 years. Assuming salvage value of the project is zero; DETERMINE the IRR of the project.

Present value interest factor of an (ordinary) annuity of Re 1 per period at i% for n periods, PVIFA(i,n).

Period	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.901	0.893	0.885	0.877	0.870	0.862	0.855	0.847	0.840	0.833
2	1.713	1.690	1.668	1.647	1.626	1.605	1.585	1.566	1.547	1.528
3	2.444	2.402	2.361	2.322	2.283	2.246	2.210	2.174	2.140	2.106
4	3.102	3.037	2.974	2.914	2.855	2.798	2.743	2.690	2.639	2.589
5	3.696	3.605	3.517	3.433	3.352	3.274	3.199	3.127	3.058	2.991
6	4.231	4.111	3.998	3.889	3.784	3.685	3.589	3.498	3.410	3.326
7	4.712	4.564	4.423	4.288	4.160	4.039	3.922	3.812	3.706	3.605
8	5.146	4.968	4.799	4.639	4.487	4.344	4.207	4.078	3.954	3.837
9	5.537	5.328	5.132	4.946	4.772	4.607	4.451	4.303	4.163	4.031
10	5.889	5.650	5.426	5.216	5.019	4.833	4.659	4.494	4.339	4.192

Investment / Annual Inflow = 10,00,000 / 2,50,000 = 4

The PVAF Table Suggest That the IRR will be Between 12% and 13%, Now we Shall Find NPV at Both these Rates.

Find Out Actual IRR

NPV @12% = (1000000) + (4.111 X 250000)
= 27750

NPV @13% = (1000000) + (3.998 X 250000)
= (500)

Interpolation Formula

IRR = [Start Rate] + [Surplus at Start Rate] / [Surplus at start rate - Dificit at End Rate] x Difference in Rate

IRR = 12 + 27750 / 27750+500 X 1

IRR = 12+27750 / 28250

IRR = 12+0.98

IRR = 12.98

ILLUSTRATION 8

CALCULATE the internal rate of return of an investment of ₹ 1,36,000 which yields the following cash inflows:

Year	Cash Inflows (₹)
1	30,000
2	40,000
3	60,000
4	30,000
5	20,000

Statement Showing NPV of the Project

YEAR	CASH FLOW	PVF AT 10%	DCF	PVF AT 15%	DCF
0	-136,000	1.00	-136000	1.00	-136000
1	30,000	0.909	27270	0.870	26100
2	40,000	0.826	33040	0.756	30240
3	60,000	0.751	45060	0.658	39480
4	30,000	0.683	20490	0.572	17160
5	20,000	0.621	12420	0.497	9940
			2280		**-13080**

IRR = [Start Rate] + [Surplus at Start Rate] / [Surplus at start rate - Deficit at End Rate] x Difference in Rate
IRR = 10 + 2280/ 2280 +13080 X 5
IRR = 10+ 0.74
IRR = 10.74
IRR = 10.74%

ILLUSTRATION 9

A company proposes to install machine involving a capital cost of ₹3,60,000. 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 ₹68,000 per annum. The company's tax rate is 45%.

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

Discounting rate	*14*	*15*	*16*	*17*	*18*
Cumulative factor	*3.43*	*3.35*	*3.27*	*3.20*	*3.13*

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

Statement Showing Annual CFAT		
Sr. No.	Particulars	Amount
A	Income After Depreciation	68000
B	Less : Tax @45%	30600
C	Profit After Tax	37400
D	Add : Depreciation (360000/5)	72000
E	CFAT (C+D)	109400

Annuity Factor at 5 Year = 360000 / 109400 = 3.290

NPV @15% = (360000) + (109400 X 3.35)
= (360000) + 366490
= 6490

NPV @16% = (360000) + (109400 X 3.27)
= (360000) + 357738
= (2262)

IRR = [Start Rate] + [Surplus at Start Rate] / [Surplus at start rate - Deficit at End Rate] x Difference in Rate

IRR = 15 + 6490 / 6490 + 2262 X 1

IRR = 15 + 6490 / 8752

IRR = 15 + 0.7415

IRR = 15.74%

DISCOUNTED PAYBACK PERIOD

When the payback period is computed after discounting the cash flows by a predetermined rate. It is called as the ‘Discounted payback period’.

The formula remains the same as in payback period.

The following format may be adopted for presentation of the answer

YEAR	CFAT	PV FACTOR	DCFAT=CFAT x PV FACTOR	CUMULATIVE DCFAT
1				
2				
3				

MODIFIED INTERNAL RATE OF RETURN

As mentioned earlier, there are several limitations attached with the concept of the conventional Internal Rate of Return (IRR). The MIRR addresses some of these deficiencies e.g., it eliminates multiple IRR rates it addresses the reinvestment rate issue and produces results which are consistent with the Net Present Value method. This method is also called Terminal Value method.

Under this method, all cash flows, apart from the initial investment are brought to the terminal value using an appropriate discount rate (usually the Cost of Capital). This results in a single stream of cash inflow in the terminal year. The MIRR is obtained by assuming a single outflow in the zeroth year and the terminal cash inflow as mentioned above. The discount rate which equates the present value of the terminal cash inflow to the zeroth-year outflow is called the MIRR

The decision criterion of MIRR is same as IRR i.e. you accept an investment if MIRR is larger than required rate of return and reject if it is lower than the required rate of return

ILLUSTRATION 10

An investment of ₹ 1,36,000 yields the following cash inflows (profits before depreciation but after tax). DETERMINE MIRR considering 8% as cost of capital.

Year	(₹)
1	30,000
2	40,000
3	60,000
4	30,000
5	20,000
	1,80,000

Present value interest factor of Re 1 per period at i% for n periods, PVIF(i,n).

Period	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.935	0.926	0.917	0.909
2	0.980	0.961	0.943	0.925	0.907	0.890	0.873	0.857	0.842	0.826
3	0.971	0.942	0.915	0.889	0.864	0.840	0.816	0.794	0.772	0.751
4	0.961	0.924	0.888	0.855	0.823	0.792	0.763	0.735	0.708	0.683
5	0.951	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621
6	0.942	0.888	0.837	0.790	0.746	0.705	0.666	0.630	0.596	0.564
7	0.933	0.871	0.813	0.760	0.711	0.665	0.623	0.583	0.547	0.513
8	0.923	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467
9	0.914	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424
10	0.905	0.820	0.744	0.676	0.614	0.558	0.508	0.463	0.422	0.386

Statement Showing Future Value of Cash flow at the End of Project Life

Year	Cash Flow	FVF @8%	Future Value
1	30,000	1.3605	40,815
2	40,000	1.2597	50,388
3	60,000	1.1664	69,984
4	30,000	1.08	32,400
5	20,000	1.00	20,000
			2,13,587

PVF = 136000 / 213587 = 0.6367

MIRR = 9% Approx

NPV V/S IRR

NPV Versus IRR - Higher the NPV, higher will be the IRR However, NPV and IRR may give conflicting results in Following Situations

a) Initial Investment Disparity, i.e different project sizes,
b) Project life Disparity, i.e different in project lives,
c) Outflows Patterns, i.e when cash outflows arise at different point of time during the project life, rather than as initial investment (Time 0) only.
d) Cash flow Disparity, i.e when there is a huge difference between initial CFAT and later years CFAT. A project with heavy initial CFAT than compared to later years will have higher IRR, and vice-versa.

The presumption in IRR is that intermediate cash inflows will be reinvested at that rate (IRR); Whereas in the case of NPV method, intermediate cash inflows are presumed to be reinvested at the Cut-off rate. The latter presumption viz. Reinvestment is at the Cut-off rate is more realistic than reinvestment at IRR. Hence, in case of conflicting decisions based on NPV And IRR , The NPV Method must prevail.

PROJECT WITH VARYING LIVES

In appraising projects with varying lives, due thought must be given to the reinvestment opportunities existing at the end of the different economic lives of the project. A Simple Comparison of NPV is Not Justifiable. The problem can be handled by annualizing the respective cash flow patterns of the alternative projects under study. The process of annualizing the net present value of the cash inflow or outflow of an investment proposal involves conversion of the present value into an annuity over the economic life of the proposal at suitable opportunity Cost.

$$\text{Annualized net Cost/ benefit/ NPV} = \frac{NPV}{PV\ Annuity\ factor\ over\ the\ project\ life}$$

or

NPV x capital recovery factor over the project life

ACCEPT REJECT CRITERIA

1. If the proposals are cost proposal, the proposal with minimum annualized cost shall be selected.

2. If the proposals are cost & benefit proposals, the proposal with maximum annualized NPV shall be selected.

ILLUSTRATION 11

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 which the company should buy?

The present value (PV) factors at 9% are:

Year	t_1	t_2	t_3
$PVIF_{0.09.t}$	0.917	0.842	0.772

Computation of Equivalent Annual Present value of Cash outflow of Machine X

Equal Annual PV of Cost = $\frac{\text{Present value of Initial Investment} + \text{PV of running cost of 400000 per annum for 3 years}}{\text{PVAF @ 9\% for 3 years}}$

$= \frac{(1500000 \times 1) + (400000 \times \text{PVAF @ 9\% for 3 yrs})}{2.531}$

$$= \frac{1500000 + 400000 \times 2.531}{2.531}$$

$$= \frac{1500000 + 1012400}{2.531}$$

$$= 992651$$

Computation of Equalised Annual Present Value of Cash outflow of machine :

Equal Annual Cost = PV of Initial Investment + PV of running cost of 600 000 for 2 yrs

PVAF @ 9%, for 2 years

$$= \frac{(1000000 \times 1) + (600000 \times \text{PVAF @ 9\% for 2 yrs})}{\text{PVAF @ 9\% for 2 yrs.}}$$

$$= \frac{1000000 + (600000 \times 1.759}{1.759}$$

$$= \frac{1000000 + 1055400}{1.759}$$

$$= 2055400 / 1.759 = 1168505$$

Conclusion :- As Equalised Annual Present Value of machine X is lower than machine Y, it is advisable to adopt project X.

Statement Showing Equalized Annual NPV

Sr.No	Particulars	Machine 'X'	Machine 'Y'
A	Cost of Machine	1500000	1000000
B	Running Cost per Year	400000	600000
C	Project Life	3 Years	2 Years
D	PVAF @9% for Project Life	2.531	1.759
E	PV of Running Cost (B X D)	1012400	1055400
F	Total PV of Cost (A+E)	2512400	2055400
G	Equalized Annual Cost (F/E)	992651	1168505

Conclusion : Machine X shall be Installed as the Annualized Cost of Machine X is Lower than Machine Y.

CAPITAL RATIONING

A firm normally fixes up maximum amount that can be invested in capital projects during a given period of time. The firm then attempts to select a combination of investment proposals, that will within the specific limits provide maximum profitability and put them in descending order according to their rate of return. Such a situation is called Capital Rationing. The situation may arise due to-

- Financing capital expenditure only by way of retained earnings.
- Allocation of specified departmental limits
- Restricted availability of own funds and thereby restrictions on borrowings.

The investment proposals are classified as under

NATURE OF PROJECT	INDIVISIBLE	DIVISIBLE
Meaning	Investment should be made in full, Partial or proportionate investment is not possible	Partial investment is possible & proportionate NPV can be generated.
Steps involved in decision making	- Determine the combination of projects to utilize amount Available. - Compute NPV of each combination - Select Combination with maximum NPV	- Compute PI of various projects & rank them - Projects are selected based on maximum Profitability Index.

ILLUSTRATION 12 (PYP NOV 2019) 5 MARKS

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.

(i) Optimizing returns when projects are independent and divisible.

Statement Showing PI of all Projects and Ranking

Project	Calculation of PI $\frac{\text{NPV + Cash Outflow}}{\text{Cash Outflow}}$	PI	Ranking
C	(20000+40000)/40000	1.50	1
D	(35000+100000)/100000	1.35	3
E	(24000+50000)/50000	1.48	2
F	(18000+60000)/60000	1.30	4

Building up of a Package of Projects based on their Rankings

Project	Investment (₹)	NPV (₹)
C	40,000	20,000
E	50,000	24,000
D (1/10th of Project)	10,000	3,500
Total	1,00,000	47,500

The company would be well advised to invest in Projects C, E and D (1/10th) and reject Project F to optimise return within the amount of ₹ 1,00,000 available for investment.

(ii) Optimizing returns when projects are indivisible.

Package of Project	Investment (₹)	Total NPV (₹)
C and E	90,000 (40,000 + 50,000)	44,000 (20,000 + 24,000)
C and F	1,00,000 (40,000 + 60,000)	38,000 (20,000 + 18,000)
Only D	1,00,000	35,000

The company would be well advised to invest in Projects C and E to optimise return within the amount of ₹ 1,00,000 available for investment.

ILLUSTRATION 13

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 values 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 investments required and present values 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. CALCULATE NPV of the projects and STATE which project or projects should be chosen?

Statement Showing NPV of Various Combinations

Project	Investment Required	PV of Future Cash Inflows	NPV
1	200000	290000	90000
2	115000	185000	70000
3	270000	400000	130000
1 & 2	315000	475000	160000
1 & 3	440000	690000	250000
2 & 3	385000	620000	235000
1, 2 & 3	680000	910000	230000
	(WN 1)	**(WN 2)**	

Conclusion : Project 1 and 3 are to be Taken Together as they are Giving Highest NPV.

Investment Required if 1 ,2 & 3 Taken together

Sr.No		Particulars	Amount
A	Investment for 1&3		440000
B	Investment for 2		115000
C	Additional Cost of Plant		125000
D	Total Investment Required (A+B+C)		680000

PV of Inflow if 1 ,2 & 3 Taken together

Sr.No		Particulars	Amount
A	PV Inflow of 2&3		620000
B	PV Inflow of 1		290000
C	Total PV of Inflow of 1,2&3		910000

SUMMARY

- Capital budgeting is the process of evaluating and selecting long-term investments that are in line with the goal of investor's wealth maximization

- The capital budgeting decisions are important & crucial business decisions due to substantial expenditure involved, long period for the recovery of benefits, irreversibility of decisions and the complexity involved in capital investment decisions.

- Tax payments like other payments must be properly deducted in deriving the cash flows. That is cash flows must be defined in post-tax terms.

- There are various techniques available for evaluating capital budgeting proposals. Some techniques use concept of time value of money, e.g. net present value technique, profitability index, internal rate of return method and discounted payback period.

- Some techniques don't use concept of time value money. Eg payback period and accounting rate of return.

- **Capital rationing** -it is a situation where there is restriction on availability of funds. In capital rationing the firm attempts to select a combination and ranks them in descending order according to their rate of return.

- Whenever amount of tax is given depreciation can be ignored & we can get CFAT directly by deducting amount of tax there is no need to deduct depreciation and add back the depreciation .

- In calculation of payback period, cash flows are considered without discounting and in calculation of discounted payback period discounted cash flows are considered.

- While calculating PI, discount rate considered is cost of capital.

- If NPV is positive, it indicates that company is earning more than expectations. IRR indicates how much company is earning in terms of percentage.

- With increase in discount rate, NPV decreases and vice versa.

- Inflows are achieved by two ways.

  - By increasing the output level
  - By reducing the costs (hence tax saving is treated as inflow)

- In case inflows are not given, project which has lower present value of cash outflow should be selected. We assume that inflows are same for both the projects.

- Whenever life of proposals is different, investment decisions should be taken on basis of equalized annual NPV calculated as follows

$$\text{Equalized annual NPV} = \frac{NPV}{Present\ Value\ annuity\ factor\ over\ of\ project}$$

- Idle funds (funds which are raised but not invested) have cost. Hence firm should try to invest maximum of its funds in the projects.

- PV of initial outflows is same at all discount rates as discounting factor is always 1 for initial cash outflow.

- Discounted payback period is always more than payback period since discounted payback period considers the discounted cash flows which are always lesser than undiscounted cash flows and hence discounted payback period increases.

- Depreciation is not provided on amount of working capital

- While calculating IRR we have to consider all types of inflows i.e. annual CFAT, scrap value, recovery of working capital, tax saving etc.

- Capital gain on transfer of capital asset is deemed to be short term capital gain

- Remember to take recovery of working capital and scrap value in Last year

ILLUSTRATION 14

X Limited is considering purchasing of new plant worth ₹80,00,000. The expected net cash flows after taxes and before depreciation are as follows:

Year	Net Cash Flows (₹)
1	14,00,000
2	14,00,000
3	14,00,000
4	14,00,000
5	14,00,000
6	16,00,000
7	20,00,000
8	30,00,000
9	20,00,000
10	8,00,000

The rate of cost of capital is 10%.

You are required to CALCULATE:

(i) Pay-back period

(ii) Net present value at 10 discount factor

(iii) Profitability index at 10 discount factor

(iv) Internal rate of return with the help of 10% and 15% discount factor

The following present value table is given for you:

Year	Present value of ₹ 1 at 10% discount rate	Present value of ₹ 1 at 15% discount rate
1	0.909	0.87
2	0.826	0.756
3	0.751	0.658

4	0.683	0.572
5	0.621	0.497
6	0.564	0.432
7	0.513	0.376
8	0.467	0.327
9	0.424	0.284
10	0.386	0.247

STATEMENT SHOWING CUMULATIVE CASH FLOW

Year	Cash Flow	Cumulative Cash Flows
1	1,400,000	1,400,000
2	1,400,000	2,800,000
3	1,400,000	4,200,000
4	1,400,000	5,600,000
5	1,400,000	7,000,000
6	1,600,000	8,600,000
7	2,000,000	10,600,000
8	3,000,000	13,600,000
9	2,000,000	15,600,000
10	800,000	16,400,000

Payback Period = 5 Years + 1000000 / 1600000

= 5 Years + 0.625 Years

= 5 Years and 7.5 Months.

STATEMENT SHOWING NPV AT 10% & 15%

YEAR	CASH FLOW	PRESENT VALUE FACTOR AT 10%	DISCOUNTED CASH FLOW	PRESENT VALUE FACTOR AT 15%	DISCOUNTED CASH FLOW
0	-8,000,000	1.00	-8,000,000	1.00	-8,000,000
1 To 5	1,400,000	3.790	5,306,000	3.353	4,694,200
6	1,600,000	0.564	902,400	0.432	691,200
7	2,000,000	0.513	1,026,000	0.376	752,000
8	3,000,000	0.467	1,401,000	0.327	981,000
9	2,000,000	0.424	848,000	0.284	568,000
10	800,000	0.386	308,800	0.247	197,600
NPV			**1,792,200**		**-116,000**

Computation of PI

Profitability Index at 10% = (NPV + Cash Outflow) / Cash Outflow
= (1792200 + 8000000)/ 8000000
= 1.224

Computation of IRR

IRR = [Start Rate] + [Surplus at Start Rate] / [Surplus at start rate + Deficit at End Rate] x Difference in Rate
IRR = 10 +(1792200 / 1792200 + 116000) X 5
IRR = 10 + 1792200 / 1908200 X 5
IRR = 10 + 4.70
IRR = 14.70 %

ILLUSTRATION 15

Following data has been available for a capital project:

Annual cash inflows	₹ 1,00,000
Useful life	4 years
Salvage value	0
Internal rate of return	12%
Profitability index	1.064

You are required to CALCULATE the following for this project:

(i) Cost of project

(ii) Cost of capital

(iii) Net present value

(iv) Payback period

PV factors at different rates are given below:

Discount factor	12%	11%	10%	9%
1 year	0.893	0.901	0.909	0.917
2 year	0.797	0.812	0.826	0.842
3 year	0.712	0.731	0.751	0.772
4 year	0.636	0.659	0.683	0.708

i) Cost Of Project

At IRR PV of Cah Outflow is Equal to PV of Cash Inflow

Cost of Project (Discounted Cash Outflow) = Annual Cash Inflow X PVAF@12% for 4 Years (Discounted Cash Inflow)

Cost of Project = 100000 X 3.038

Cost of Project = 303800

ii) Computation of NPV

PI = NPV + Cash Outflow / Cash Outflow

1.064 = NPV + 303800 / 303800

323243 = NPV + 303800

NPV = 19443

iii) Computation of Payback Period

Payback Period = Total Investment / Annual Cash Inflow

= 303800 / 100000

= 3.038 Years

iv) Cost of Capital

Statement Showing NPV of the Project			
Year	Cash Flow	Present Value Factor @10%	Discounted Cash Flow
0	-3,03,800	1.00	-3,03,800
1 To 4	1,00,000	x	3,23,243
NPV			**19,443**

x = 3.2324

At 9% Dicountinng Rate PVAF for 4 Years is 3.23

Hence, Cost of Capital is 9%

Cash Outflow + NPV = Annual Cash Inflow X PVAF@ Cost of Capital for 4 Years

303800 + 19443 = 100000 X PVAF@ Cost of Capital for 4 Years

PVAF@ Cost of Capital for 4 Years = 3.23242

ILLUSTRATION 16

Lockwood Limited wants to replace its old machine with a new automatic machine. Two models A and B are available at the same cost of ₹ 5 lakhs each. Salvage value of the old machine is ₹ 1 lakh. The utilities of the existing machine can be used if the company purchases model A. Additional cost of utilities to be purchased in this case will be ₹ 1 lakh. If the company purchases B, then all the existing utilities will have to be replaced with new utilities costing ₹ 2 lakhs. The salvage value of the old utilities will be ₹ 0.20 lakhs. The earnings after taxation are expected to be:

Year	Cash inflows of A (₹)	Cash inflows of B (₹)	P.V. Factor @ 15%
1	1,00,000	2,00,000	0.870
2	1,50,000	2,10,000	0.756
3	1,80,000	1,80,000	0.658
4	2,00,000	1,70,000	0.572
5	1,70,000	40,000	0.497
Salvage Value at the end of Year 5	50,000	60,000	

The targeted return on capital is 15%. You are required to (i) COMPUTE, for the two machines separately, net present value, discounted payback period and desirability factor and (ii) STATE which of the machines is to be selected?

Statement Showing NPV Of Projects

YEAR	PARTICULARS	PVF AT 15%	MACHINE A		MACHINE B	
			CF	DCF	CF	DCF
0	Initial Cash outflow	1.00	(500000)	(500000)	(580000)	(580000)
1	CFAT	.870	100000	87000	200000	174000
2	CFAT	.756	150000	113400	210000	158760
3	CFAT	.658	180000	118440	180000	118440
4	CFAT	.572	200000	114400	170000	97240
5	CFAT	.497	170000	84490	40000	19880
5	Salvage Value	.497	50000	24850	60000	29820
		NPV		42580		18140

Statement Showing Discounted Payback Period

YEAR	MACHINE A		MACHINE B	
	DISCOUNTED CASH FLOWS	CUMULATIVE DISCOUNTED CASH FLOWS	DISCOUNTED CASH FLOWS	CUMULATIVE DISCOUNTED CASH FLOWS
1	87000	87000	174000	174000
2	113400	200400	158760	332760
3	118440	318840	118440	451200
4	114400	433240	97240	548440
5	84490 + 24850 = 109340	542580	19880 + 29820 = 49700	598140

$$\text{Machine A} = 4 \text{ years} + \left(\frac{5,00,000 - 4,33,240}{1,09,340} \right) = 4.61 \text{ years}$$

$$\text{Machine B} = 4 \text{ years} + \left(\frac{5,80,000 - 5,48,440}{49,700} \right) = 4.63 \text{ years}$$

Statement Showing Profitability Index

Desirability Factor or Profitability Index:

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

$$\text{Machine A} = \frac{₹\,5,42,580}{₹\,5,00,000} = 1.08; \quad \text{Machine B} = \frac{₹\,5,98,140}{₹\,5,80,000} = 1.03$$

Conclusion

Since the absolute surplus in the case of A is more than B and also the desirability factor, it is better to choose A.

The discounted payback period in both the cases is almost same, also the net present value is positive in both the cases, but the desirability factor (profitability index) is higher in the case of Machine A, it is therefore better to choose Machine A.

WN 1 - Statement Showing Initial Cash Outflow

SR.NO	PARTICULARS	MACHINE A	MACHINE B
A	Cost of Machine	500000	500000
B	Add - Cost of utilities	100000	200000
C	Less - Salvage value of Old Machine	100000	100000
D	Less - Salvage value of Old Utilities	-	20000
E	Total Expenditure (Net)	500000	580000

ILLUSTRATION 17

Hindlever Company is considering a new product line to supplement its range of products. It is anticipated that the new product line will involve cash investments of ₹ 7,00,000 at time 0 and ₹ 10,00,000 in year 1. After-tax cash inflows of ₹ 2,50,000 are expected in year 2, ₹ 3,00,000 in year 3, ₹ 3,50,000 in year 4 and ₹ 4,00,000 each year thereafter through year 10. Although the product line might be viable even after year 10, the company prefers to be conservative and end all calculations at that time.

(a) If the required rate of return is 15 per cent, COMPUTE net present value of the project. Is it acceptable?

(b) ANALYSE what would be the case if the required rate of return were 10 per cent?

(c) CALCULATE its internal rate of return.

(d) COMPUTE the project's payback period.

Statement Showing NPV of the Project at 15%

YEAR	CASH FLOW	PRESENT VALUE FACTOR AT 15%	DISCOUNTED CASH FLOW
0	-700,000	1.00	-700,000
1	-1,000,000	0.870	-870000
2	250,000	0.756	189000
3	300,000	0.658	197,400
4	350,000	0.572	200,200
5 To 10	400,000	2.164	865,600
NPV			**(117800)**

Statement Showing NPV of the Project at 10%

YEAR	CASH FLOW	PRESENT VALUE FACTOR AT 10%	DISCOUNTED CASH FLOW
0	-700,000	1.00	-700,000
1	-1,000,000	0.909	-909,000
2	250,000	0.826	206,500
3	300,000	0.751	225,300
4	350,000	0.683	239,050
5 To 10	400,000	2.975	1190000
NPV			**251850**

$$IRR = \text{Start rate} + \frac{\text{Surplus at start rate}}{\text{Surplus at start rate} - \text{Deficit at end rate}} \times \text{Diff between rates}$$

$$= 10 + \frac{251850}{251850 + 117800} \times 5$$

$$= 10 + \frac{251850}{369650} \times 5$$

$$= 10 + 3.41 = 13.41\%$$

Statement Showing Projects Payback Period

Year	Cash Flow	Cumulative Cash Flow
1	0	0
2	250,000	250,000
3	300,000	550,000
4	350,000	900,000
5	400,000	1,300,000
6	400,000	1,700,000

Payback Period = 6 Years

ILLUSTRATION 18

XYZ Ltd. is planning to introduce a new product with a project life of 8 years. Initial equipment cost will be ₹ 3.5 crores. Additional equipment costing ₹ 25,00,000 will be purchased at the end of the third year from the cash inflow of this year. At the end of 8 years, the original equipment will have no resale value, but additional equipment can be sold for ₹ 2,50,000. A working capital of ₹ 40,00,000 will be needed and it will be released at the end of eighth year. The project will be financed with sufficient amount of equity capital.

The sales volumes over eight years have been estimated as follows:

Year	1	2	3	4 – 5	6 – 8
Units per year	72,000	1,08,000	2,60,000	2,70,000	1,80,000

A sales price of ₹ 240 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating costs will amount ₹ 36,00,000 per year. The loss of any year will be set off from the profits of subsequent two years. The company is subject to 30 per cent tax rate and considers 12 per cent to be an appropriate after-tax cost of capital for this project. The company follows straight line method of depreciation.

CALCULATE the net present value of the project and advise the management to take appropriate decision.

The PV factors at 12% are

Year	1	2	3	4	5	6	7	8
PV Factor	0.893	0.797	0.712	0.636	0.567	0.507	0.452	0.404

STATEMENT SHOWING NPV				
YEAR	PARTICULARS	CASH FLOW	PVF AT 12%	DCF
0	INITIAL CASH OUTFLOW	-350	1	-350
0	WORKING CAPITAL	-40	1	-40
1	CFAT	33.12	0.893	29.58
2	CFAT	63.69	0.797	50.76
3	CFAT	162.645	0.712	115.80
3	ADDITIONAL CASH OUTFLOW	-25	0.712	-17.8
4 TO 5	CFAT	170.715	1.203	205.37
6 TO 8	CFAT	110.235	1.363	150.25
8	SV OF ADDITIONAL EQUIPMENT	2.5	0.404	1.01
8	RELEASE OF WORKING CAPITAL	40	0.404	16.16
			NPV	161.13

WN 1 - CALCULATION OF ANNUAL CFAT (AMOUNT IN LAKHS)

SR.NO	PARTICULARS	YEAR				
		1	2	3	4 TO 5	6 TO 8
A	Units Sold	0.72	1.08	2.60	2.70	1.80
B	Sales (A*240)	172.8	259.2	624	648	432
C	Less - VC (60% of A)	103.68	155.52	374.4	388.8	259.2
D	Less - FC	36	36	36	36	36
E	Less - Dep	43.75	43.75	43.75	48.25	48.25
F	Profit (B-C-D-E)	-10.63	23.93	169.85	174.95	88.55
G	Tax at 30%	0	3.99	50.955	52.485	26.565
H	Profit After Tax (F-G)	-10.63	19.94	118.895	122.465	61.985
I	Cash Inflow (H+E)	33.12	63.69	162.645	170.715	110.235

ILLUSTRATION 19

A large profit making company is considering the installation of a machine to process the waste produced by one of its existing manufacturing process to be converted into a marketable product. At present, the waste is removed by a contractor for disposal on payment by the company of ₹ 150 lakh per annum for the next four years. The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of ₹ 90 lakh before the processing operation starts. This compensation is not allowed as deduction for tax purposes.

The machine required for carrying out the processing will cost ₹ 600 lakh. At the end of the 4^{th} year, the machine can be sold for ₹ 60 lakh and the cost of dismantling and removal will be ₹ 45 lakh.

Sales and direct costs of the product emerging from waste processing for 4 years are estimated as under:

(₹ In lakh)

Year	1	2	3	4
Sales	966	966	1,254	1,254
Material consumption	90	120	255	255
Wages	225	225	255	300
Other expenses	120	135	162	210
Factory overheads	165	180	330	435
Depreciation (as per income tax rules)	150	114	84	63

Initial stock of materials required before commencement of the processing operations is ₹ 60 lakh at the start of year 1. The stock levels of materials to be maintained at the end of year 1, 2 and 3 will be ₹ 165 lakh and the stocks at the end of year 4 will be nil. The storage of materials will utilise space which would otherwise have been rented out for ₹ 30 lakh per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of ₹ 45 lakh in the year- 1 and ₹ 30 lakh in the year- 2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of ₹ 90 lakh per annum payable on this venture. The company's tax rate is 30%.

Consider cost of capital @ 14%, the present value factors of which is given below for four years:

Year	1	2	3	4
PV factors @14%	0.877	0.769	0.674	0.592

ADVISE the management on the desirability of installing the machine for processing the waste. All calculations should form part of the answer.

STATEMENT SHOWING NPV				
YEAR	**PARTICULARS**	**CASH FLOW**	**PVF AT 12%**	**DCF**
0	INITIAL CASH OUTFLOW	(600)	1	(600)
0	INVESTMENT IN STOCK	(60)	1	(60)
0	COMPENSATION TO CONTRACTOR	(90)	1	(90)
1	ADDITIONAL INVESTMENT IN STOCK	(105)	0.877	(92.09)
1	CFAT	469.2	0.877	411.49
2	CFAT	416.4	0.769	320.21
3	CFAT	453.6	0.674	305.73
4	CFAT	382.2	0.592	226.26
4	NET SALE VALUE OF ASSET	15	0.592	8.88
4	RELEASE OF STOCK	165	0.592	97.68
			NPV	**528.16**

WN 1 - CALCULATION OF ANNUAL CFAT

SR.NO	PARTICULARS	YEAR			
		1	2	3	4
A	Sales	966	966	1254.00	1254.00
B	Less -Material Consumption	90	120	255	255
C	Less - Wages	180	195	255	300
D	Less - Other Expenses	120	135	162	210
E	Less - factory Overheads (Insurance)	90	90	90	90
F	Less - Depreciation	150	114	84	63
G	Profit Before tax	336	312	408	336
H	Less - Opportunity Cost of Rent Foregone	30	30	30	30
I	Add - Saving In Contractor Payment	150	150	150	150
J	Total Cash Flow Before Tax (G-H+I)	456	432	528	456
K	Less - Tax at 30%	136.8	129.6	158.4	136.8
L	Total Cash Flow After Tax (J-K+F)	469.2	416.4	453.6	382.2

ILLUSTRATION 20

Xavly Ltd. has a machine which has been in operation for 3 years. The machine has a remaining estimated useful life of 5 years with no salvage value in the end. Its current market value is ₹ 2,00,000. The company is considering a proposal to purchase a new model of machine to replace the existing machine. The relevant information is as follows:

	Existing Machine	New Machine
Cost of machine	₹ 3,30,000	₹ 10,00,000
Estimated life	8 years	5 years
Salvage value	Nil	₹ 40,000
Annual output	30,000 units	75,000 units

Selling price per unit	₹ 15	₹ 15
Annual operating hours	3,000	3,000
Material cost per unit	₹ 4	₹ 4
Labour cost per hour	₹ 40	₹ 70
Indirect cash cost per annum	₹ 50,000	₹ 65,000

The company uses written down value of depreciation @ 20% and it has several other machines in the block of assets. The Income tax rate is 30 per cent and Xavly Ltd. does not make any investment, if it yields less than 12 per cent.

ADVISE Xavly Ltd. whether the existing machine should be replaced or not.

PV factors @12%:

Year	1	2	3	4	5
PVF	0.893	0.797	0.712	0.636	0.567

STATEMENT SHOWING COMPUTATION OF INCREMENTAL NPV

YEAR	PARTICULARS	CASH FLOW	PVF AT 12%	DCF
0	INITIAL CASH OUTFLOW	-800000	1	-800000
1	INCREMENTAL CFAT	321000	0.893	286653
2	INCREMENTAL CFAT	311400	0.797	248186
3	INCREMENTAL CFAT	303720	0.712	216249
4	INCREMENTAL CFAT	297576	0.636	189258
5	INCREMENTAL CFAT	292661	0.567	165939
5	INCREMENTAL SV	40000	0.567	22680
			NPV	328964

WN 1 - STATEMENT SHOWING INCREMENTAL INITIAL CASH FLOW

SR.NO	PARTICULARS	AMOUNT
A	COST OF NEW MACHINE	1000000
B	LESS - SALE PROCEEDS OF EXISTING MACHINE	200000
C	NET INITIAL CASH OUTFLOW	800000

WN 2 COMPUTATION OF WDV OF BLOCK FOR DEP

SR.NO	PARTICULARS	AMOUNT
A	COST OF EXISTING MACHINE	330000
B	LESS - DEP FOR 3 YEARS AS PER WDV	161040
	METHOD AT 20% PER ANNUM	
C	WDV OF EXISTING MACHINE AT THE END	168960
	OF 3 YEARS (A-B)	
D	SALE VALUE OF MACHINE	200000
E	GAIN ON SALE OF MACHINE TO BE REDUCED	31040
	FROM BLOCK (D-C)	
F	AMOUNT OF NEW ASSET	1000000
G	DEPRECIABLE VALUE OF BLOCK (F-E)	968960
H	INCREMENTAL WDV OF BLOCK (G-H)	800000

WN 3 STATEMENT SHOWING INCREMANTAL PROFIT

SR.NO	PARTICULARS	MACHINE	
		EXISTING	NEW
A	ANNUAL OUTPUT	30000	75000
B	SELLING PRICE	15	15
C	SALES (A*B)	450000	1125000
D	LESS - MATERIAL COST (A*4)	120000	300000
E	LESS - LABOUR COST		
	EXISTING (3000*40)	120000	
	NEW (3000*70)		210000
H	LESS - INDIRECT COST	50000	65000
I	PROFIT BEFORE TAX (C-D-E-H)	160000	550000
J	INCREMENTAL PROFIT	390000	

WN 4 STATEMENT SHOWING INCREMANTAL CFAT

SR.NO	PARTICULARS	1	2	3	4	5
A	INCREMENTAL PROFIT	390000	390000	390000	390000	390000
B	INCREMENTAL DEPRECIATION	160000	128000	102400	81920	65536
C	INCREMENTAL PROFIT AFTER DEP (A-B)	230000	262000	287600	308080	324464
D	LESS - TAX AT 30%	69000	78600	86280	92424	97339
E	ANNUAL INCREMENTAL CFAT (C-D+B)	321000	311400	303720	297576	292661

ILLUSTRATION 21

HMR Ltd. is considering replacing a manually operated old machine with a fully automatic new machine. The old machine had been fully depreciated for tax purpose but has a book value of ₹ 2,40,000 on 31st March 2021. The machine has begun causing problems with breakdowns and it cannot fetch more than ₹ 30,000 if sold in the market at present. It will have no realizable value after 10 years. The company has been offered ₹ 1,00,000 for the old machine as a trade in on the new machine which has a price (before allowance for trade in) of ₹ 4,50,000. The expected life of new machine is 10 years with salvage value of ₹ 35,000.

Further, the company follows straight line depreciation method but for tax purpose, written down value method depreciation @ 7.5% is allowed taking that this is the only machine in the block of assets.

Given below are the expected sales and costs from both old and new machine:

	Old machine (₹)	New machine (₹)
Sales	8,10,000	8,10,000
Material cost	1,80,000	1,26,250
Labour cost	1,35,000	1,10,000
Variable overhead	56,250	47,500
Fixed overhead	90,000	97,500
Depreciation	24,000	41,500
PBT	3,24,750	3,87,250
Tax @ 30%	97,425	1,16,175
PAT	2,27,325	2,71,075

From the above information, ANALYSE whether the old machine should be replaced or not if required rate of return is 10%? Ignore capital gain tax.

PV factors @ 10%:

Year	1	2	3	4	5	6	7	8	9	10
PVF	0.909	0.826	0.751	0.683	0.621	0.564	0.513	0.467	0.424	0.386

STATEMENT SHOWING INCREMENTAL NPV

YEAR	PARTICULARS	CASH FLOW	PVF AT 12%	DCF
0	INITIAL CASH OUTFLOW	-350000	1	-350000
1	INCREMENTAL CFAT	63875	0.909	58062
2	INCREMENTAL CFAT	63284	0.826	52273
3	INCREMENTAL CFAT	62738	0.751	47116
4	INCREMENTAL CFAT	62232	0.683	42505
5	INCREMENTAL CFAT	61765	0.621	38356
6	INCREMENTAL CFAT	61333	0.564	34592
7	INCREMENTAL CFAT	60933	0.513	31259
8	INCREMENTAL CFAT	60563	0.467	28283
9	INCREMENTAL CFAT	60221	0.424	25534
10	INCREMENTAL CFAT	59904	0.386	23123
10	SALVAGE VALUE	35000	0.386	13510
			NPV	44612

WN 1 - STATEMENT SHOWING INCREMENTAL INITIAL CASH FLOW

SR.NO	PARTICULARS	AMOUNT
A	COST OF NEW MACHINE	450000
B	LESS - SALE PROCEEDS OF EXISTING MACHINE	100000
C	NET INITIAL CASH OUTFLOW	350000

WN 2 - CALCULATION OF INCREMENTAL ANNUAL PROFIT

SR.NO	PARTICULARS	MACHINE	
		EXISTING	NEW
A	PROFIT BEFORE TAX	324750	387250
B	ADD - DEPRECIATION AS PER BOOKS	24000	41500
C	PROFIT BEFORE TAX & DEP	348750	428750
D	INCREMENTAL PROFIT BEFORE TAX & DEP	80000	

WN 3 - STATEMENT SHOWING INCREMENTAL CFAT

SR.NO	PARTICULARS	1	2	3	4	5	6	7	8	9	10
A	INCREMENTAL PROFIT	80000	80000	80000	80000	80000	80000	80000	80000	80000	80000
B	INCREMENTAL DEPRECIATION	26250	24281	22460	20776	19217	17776	16443	15210	14069	13014
C	INCREMENTAL PROFIT AFTER DEP (A-B)	53750	55719	57540	59224	60783	62224	63557	64790	65931	66986
D	LESS - TAX AT 30%	16125	16716	17262	17767	18235	18667	19067	19437	19779	20096
E	ANNUAL INCREMENTAL CFAT (C-D+B)	63875	63284	62738	62233	61765	61333	60933	60563	60221	59904

ILLUSTRATION 22

A chemical company is presently paying an outside firm ₹ 1 per gallon to dispose off the waste resulting from its manufacturing operations. At normal operating capacity, the waste is about 50,000 gallons per year.

After spending ₹ 60,000 on research, the company discovered that the waste could be sold for ₹ 10 per gallon if it was processed further. Additional processing would, however, require an investment of ₹ 6,00,000 in new equipment, which would have an estimated life of 10 years with no salvage value. Depreciation would be calculated by straight line method.

Except for the costs incurred in advertising ₹ 20,000 per year, no change in the present selling and administrative expenses is expected, if the new product is sold. The details of additional processing costs are as follows:

Variable : ₹ 5 per gallon of waste put into process.

Fixed : (Excluding Depreciation) ₹ 30,000 per year.

There will be no losses in processing, and it is assumed that the total waste processed in a given year will be sold in the same year. Estimates indicate that 50,000 gallons of the product could be sold each year.

The management when confronted with the choice of disposing off the waste or processing it further and selling it, seeks your ADVICE. Which alternative would you recommend? Assume that the firm's cost of capital is 15% and it pays on an average 50% Tax on its income.

You should consider Present value of Annuity of ₹ 1 per year @ 15% p.a. for 10 years as 5.019.

STATEMENT SHOWING NPV OF PROJECT

YEAR	CASH FLOW	PRESENT VALUE FACTOR AT 15%	DISCOUNTED CASH FLOW
0	-600,000	1.00	-600,000
1 To 10	155,000	5.019	777,945
NPV			177,945

Conclusion : As NPV is Positive, it is Advised to go Processing of Waste.

Note : Research Cost of 60000 is not Considered as it is Sunk Cost and Sunk Cost is irrelevant for Decision Making

WN 1 ASCERTAINMENT OF CFAT ON PROCESSING OF WASTE

Sr.No	Particulars	Amount
A	Sales	500000
B	Less : Variable Cost (50000X5)	250000
C	Less : Fixed Processing Cost	30000
D	Less : Depreciation (600000x10%)	60000
E	Less : Advertisement Expenses	20000
F	Earning Before Tax	140000
G	Less : Tax @50%	70000
H	Earning After Tax	70000
I	Add : Depreciation	60000
J	Cash Inflow After Tax	130000
K	Add : Savings in Waste Disposal Cost Net of Tax (50000x50%)	25000
L	Net Cash Inflow	155000

ILLUSTRATION 23 (MTP DEC 2021 SERIES 1) 10 MARKS

Sadbhavna Limited is a manufacturer of computers. It wants to introduce artificial intelligence while making computers. It estimates that the annual savings from the artificial intelligence (AI) include a reduction of five employees with annual salaries of ₹ 3,00,000 each, ₹ 3,00,000 from reduction in production delays caused by inventory problem, reduction in lost sales ₹ 2,50,000 and ₹ 2,00,000 from billing issues.

The purchase price of the system for installation of artificial intelligence is ₹ 20,00,000 with installation cost of ₹ 1,00,000. The life of the system is 5 years and it will be depreciated on a straight-line basis. The salvage value is zero which will be its market value after the end of its life of five years.

However, the operation of the new system for AI requires two computer specialists with annual salaries of ₹ 5,00,000 per person. Also, the estimated maintenance and operating expenses of 1,50,000 is required.

The company's tax rate is 30% and its required rate of return is 12%.

From the above information:

(i) CALCULATE the initial cash outflow and annual operating cash flow over its life of 5 years.

(ii) Further, EVALUATE the project by using Payback Period, Net Present Value and Profitability Index.

(iii) You are also REQUIRED to obtain the cash flows and NPV on the assumption that book salvage value for depreciation purposes is ₹ 2,00,000 even though the machine is having no real worth in terms of its resale value. Also, the book salvage value of ₹ 2,00,000 is allowed for tax purposes.

Also COMMENT on the acceptability of the project in (ii) and (iii) above.

STATEMENT SHOWING NPV & PI OF PROJECT

YEAR	PARTICULARS	CASH FLOW	PVF AT 12%	DCF
0	Initial cash Outflow (2000000+100000)	(2100000)	1.00	(2100000)
1-5	CFAT	896000	3.605	3230080
			NPV	1130080

PI = NPV + Cost of Project
Cost of Project

= 1130080 + 2100000
2100000
= 1.54

Payback period = Cost of Project
Annual CFAT

= 2100000/896000
= 2.34 Years

Conclusion – Since NPV is Positive is & PI is More than 1 , it is Advised to Accept the Project

STATEMENT SHOWING ANNUAL CFAT

SR.NO	PARTICULARS	AMOUNT
A	Reduction in Salaries (300000*5)	1500000
B	Reduction in production Delays	300000
C	Reduction in lost Sales	250000
D	Gain Due to Timely Billing	200000
E	Total Saving (A+B+C+D)	2250000
F	Less – Salary to Computer Specialist (500000*2)	1000000
G	Less – Depreciation (2100000/5)	420000
H	Less – Maintenance Cost	150000
I	Increase in Profit Before Tax (E-F-G-H)	680000
J	Less – Tax at 30%	204000
K	Profit After Tax (I-J)	476000
L	CFAT (K+G)	896000

STATEMENT SHOWING NPV

YEAR	PARTICULARS	CASH FLOW	PVF AT 12%	DCF
0	Initial cash Outflow (2000000+100000)	(2100000)	1.00	(2100000)
1-5	CFAT	884000	3.605	3186820
5	Tax Saving On capital Loss (200000*30%)	60000	0.567	34020
			NPV	1120840

Conclusion – Since NPV is Positive it is Advised to Accept the Project

STATEMENT SHOWING ANNUAL CFAT

SR.NO	PARTICULARS	AMOUNT
A	Reduction in Salaries (300000*5)	1500000
B	Reduction in production Delays	300000
C	Reduction in lost Sales	250000
D	Gain Due to Timely Billing	200000
E	Total Saving (A+B+C+D)	2250000
F	Less – Salary to Computer Specialist (500000*2)	1000000
G	Less – Depreciation (2100000-200000/5)	380000
H	Less – Maintenance Cost	150000
I	Increase in Profit Before Tax (E-F-G-H)	720000
J	Less – Tax at 30%	216000
K	Profit After Tax (I-J)	504000
L	CFAT (K+G)	884000

ILLUSTRATION 24 PYQ NOV 22 (10 MARKS)

A firm is in need of a small vehicle to make deliveries. It is intending to choose between two options. One option is to buy a new three wheeler that would cost ₹ 1,50,000 and will remain in service for 10 years.

The other alternative is to buy a second hand vehicle for ₹ 80,000 that could remain in service for 5 years. Thereafter the firm, can buy another second hand vehicle for ₹ 60,000 that will last for another 5 years.

The scrap value of the discarded vehicle will be equal to it written down value (WDV). The firm pays 30% tax and is allowed to claim depreciation on vehicles @ 25% on WDV basis.

The cost of capital of the firm is 12%.

You are required to advise the best option.

Given:

t	1	2	3	4	5	6	7	8	9	10
PVIF (t,12%)	0.892	0.797	0.711	0.635	0.567	0.506	0.452	0.403	0.360	0.322

STATEMENT SHOWING NPV

YEAR	PVF AT 12%	PARTICULARS	NEW MACHINE		SECOND HAND MACHINE	
			CF	DCF	CF	DCF
0	1	COST	-150000	-150000	-80000	-80000
1	0.892	TAX SHIELD ON DEP	11250	10035	6000	5352
2	0.797	TAX SHIELD ON DEP	8438	6725	4500	3587
3	0.711	TAX SHIELD ON DEP	6328	4499	3375	2400
4	0.635	TAX SHIELD ON DEP	4746	3014	2531	1607
5	0.567	TAX SHIELD ON DEP	3560	2018	1898	1076
6	0.506	TAX SHIELD ON DEP	2670	1351	4500	2277
7	0.452	TAX SHIELD ON DEP	2002	905	3375	1526
8	0.403	TAX SHIELD ON DEP	1502	605	2531	1020
9	0.36	TAX SHIELD ON DEP	1126	405	1898	683
10	0.322	TAX SHIELD ON DEP	845	272	1424	458
10	0.322	SCRAP VALUE OF NEW MACHINE & 1ST SECOND HAND MACHINE	8448	2720	14238	4585
5	0.567	SCRAP VALUE	-	-	18984	10764
5	0.567	COST OF 2ND SECOND HAND MACHINE	-	-	-60000	-34020
				-117450		-78685

Advise: The PV of net outflow is low in case of buying the second hand vehicles. Therefore, it is advisable to buy second hand vehicles.

WN 1 - ASCERTAINMENT OF DEPRECIATION , TAX SHEILD ON DEPRECIATION & SCRAP VALUE AT THE END OF LIFE OF NEW MACHINE

YEAR	OPENING BALANCE	DEPRECIATION	CLOSING BALANCE	TAX SHEILD ON DEPRECIATION
1	150000	37500	112500	11250
2	112500	28125	84375	8438
3	84375	21094	63281	6328
4	63281	15820	47461	4746
5	47461	11865	35596	3560
6	35596	8899	26697	2670
7	26697	6674	20023	2002
8	20023	5006	15017	1502
9	15017	3754	11263	1126
10	11263	2816	8447	845

WN 2 - ASCERTAINMENT OF DEPRECIATION , TAX SHEILD ON DEPRECIATION & SCRAP VALUE AT THE END OF LIFE OF BOTH SECOND HAND MACHINES

YEAR	OPENING BALANCE	DEPRECIATION	CLOSING BALANCE	TAX SHEILD ON DEPRECIATION
1	80000	20000	60000	6000
2	60000	15000	45000	4500
3	45000	11250	33750	3375
4	33750	8438	25313	2531
5	25313	6328	18984	1898
6	60000	15000	45000	4500
7	45000	11250	33750	3375
8	33750	8438	25313	2531
9	25313	6328	18984	1898
10	18984	4746	14238	1424

ILLUSTRATION 25 PYQ NOV 22 (10 MARKS)

A hospital is considering to purchase a diagnostic machine costing ₹ 80,000. The projected life of the machine is 8 years and has an expected salvage value of ₹ 6,000 at the end of 8 years. The annual operating cost of the machine is ₹ 7,500. It is expected to generate revenues of ₹ 40,000 per year for eight years. Presently, the hospital is outsourcing the diagnostic work and is earning commission income of ₹ 12,000 per annum.

Consider tax rate of 30% and Discounting Rate as 10%.

Advise:

Whether it would be profitable for the hospital to purchase the machine?

Give your recommendation as per Net Present Value method and Present Value Index method under below mentioned two situations:

(i) If Commission income of ₹ 12,000 p.a. is before taxes.

(ii) If Commission income of ₹ 12,000 p.a. is net of taxes.

Given:

t	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*
PVIF (t, 10%)	*0.909*	*0.826*	*0.751*	*0.683*	*0.621*	*0.564*	*0.513*	*0.467*

STATEMENT SHOWING NPV OF PROJECT
(CASE i)

YEAR	CASH FLOW	PRESENT VALUE FACTOR AT 10%	DISCOUNTED CASH FLOW
0	(80000)	1.00	(80000)
1 To 8	17125	5.334	91345
8	6000	0.467	2802
NPV			**14147**

PI = NPV + Cash outflow / Cash Outflow

PI = 14147 + 80000 / 80000

PI = 1.18

STATEMENT SHOWING NPV OF PROJECT (CASE ii)

YEAR	CASH FLOW	PRESENT VALUE FACTOR AT 10%	DISCOUNTED CASH FLOW
0	(80000)	1.00	(80000)
1 To 8	13525	5.334	72142
8	6000	0.467	2802
NPV			**(5056)**

PI = NPV + Cash outflow / Cash Outflow

PI = (5056) + 80000 / 80000

PI = 0.94

Recommendation: The hospital may consider purchasing of diagnostic machine in situation (i) where commission income is 12,000 before tax as NPV is positive and PI is also greater than 1. Contrary to situation (i), in situation (ii) where the commission income is net of tax, the recommendation is reversed to not purchase the machine as NPV is negative and PI is also less than 1.

STATEMENT SHOWING COMPUTATION OF CFAT

SR.NO	PARTICULARS	Commission Income before Taxes	Commission Income After Taxes
A	Revenue Per Annum	40000	40000
B	Less : Operating Expenses	7500	7500
C	Less : Depreciation (80000-6000/8)	9250	9250
D	Profit Before Tax	**23250**	**23250**
E	Less : Tax @30%	6975	6975
F	Earning After Tax	**16275**	**16275**
G	Add : Depreciation	9250	9250
H	Cash Inflow After Tax	**25525**	**25525**
I	Less : Loss of Commission due to Puchase	8400	12000
J	Net CFAT	**17125**	**13525**

thank you!