CHAPTER 8 CAPITAL BUDGETING

Question #1 PTP D17/J17; MQP J24/J23

Ans: ₹ 58.200; ₹ 97.200; ₹ 3,95,500;

ZZZ Co. has four potential projects all with an initial cost of ₹ 15,00,000. The capital budget for the year will only allow the company to take up only one of the three projects. Given the discount rates and the future cash flows of each project, which project should they accept?

PROJECT	Annual Net Cash Flows per year for five years (₹)	Discount Rates
A	3,50,000	4%
B	4,00,000	8%
C	5,00,000	10%

Question #2 PTP J18; MQP J24

Ans: NPV: (₹ 16,114);

ANURAG MILLS LTD. has number of machines that were used to make a product that the firm has phased out of its operations. An existing machine was originally purchased six years ago for ₹ 5,00,000 and is being depreciated by the straight-line method; its remaining useful life is 4 years. No salvage value is expected at the end of the useful life. It can currently be sold for ₹ 1,50,000. The machine can also be modified to produce another product at a cost of ₹ 2,00,000. The modifications would not affect the useful life, or salvage value, and would be depreciated using the straight-line method.

If the firm does not modify the existing machine, it will have to buy a new machine at a cost of ₹ 4,40,000, (no salvage value) and the new machine would be depreciated over 4 years. The engineers estimate that the cash operating costs with the new machine would be ₹ 25,000 per year less than with the existing machine. Cost of capital is 15 per cent and corporate tax rate is 35 per cent.

Advise the company whether the new machine should be bought, or the old equipment modified. Assume straight line method of depreciation for tax purposes and loss on sale of existing machine can be claimed as short-term capital loss in the current year itself. [Given: PVIFA (15% 4 years) = 2.855]

Question #3 PTP D18

Ans: NPV: ₹ 80,200;

ZENITH LTD. is faced with the problem of choosing between two mutually exclusive projects A and B. Project A requires a cash outlay of ₹10,00,000 and cash running expenses of ₹ 3,50,00 per year. On the other hand, Project B will cost ₹ 15,00,000 and require cash running expenses of ₹ 2,00,000 per year. Both the projects have an eight-year life. Project A has a salvage value of ₹ 40,000 and Project B has a salvage value of ₹ 1,40,000. The company's tax rate is 50% and it has a 10% required rate of return.

Required:

Assuming depreciation on straight line basis and that there is no funds constraint for the company, ascertain which project should be accepted.

[Given: PVIFA (10%, 8 years) = 5.335 and PVIF (10%, 8 years) = 0.467]

Note: Solve the problem by an incremental cash flow approach.

Question #4	PTP J19; MQP J23	Ans:	NPV: (₹ 8,350)

ELROND LTD. (EL) has just installed MACHINE A at a cost of ₹ 2,00,000. This machine has 5 years life with no residual value. The annual volume of production is estimated at 150000 units, which can be sold at ₹ 8 per unit. Annual operating costs are estimated at ₹ 2,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at ₹ 4,50,000 per annum for the same level of production.

The company has just come across another model called MACHINE B capable of giving the same output at an annual operating cost of ₹ 1,50,000 (excluding depreciation). There will be no change in fixed costs. Capital cost of this machine is ₹ 2,50,000 and the estimated life is 5 years with no residual value.

The company has an offer for sale of MACHINE A at ₹ 1,00,000. But the cost of dismantling and removal will amount to ₹ 30,000. As the company has not yet commenced operation, it wants to sell MACHINE A and purchase MACHINE B.

ELROND LTD. will be zero-tax company for 7 years in view of several incentives and allowances available. The cost of capital is 14%.

Required:

Based on the NPV Criterion, advise the Company whether it should opt to replace MACHINE A by installing MACHINE B.

[Given: PVIFA (14%, 5 years) = 3.433 and PVIF (14%, 5 years) = 0.519]
(Solve the problem by an incremental cash flow approach.)

Question #5	PTP D19	Ans:	1.088; 1.034;

MONPTEK LTD. 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 A. Additional cost of utilities to be purchased in that case is ₹ 1 lakh. If the company purchases B then all the existing utilities will have to be replaced with new utilities costing ₹ 1.8 lakhs. The earnings after taxation are expected to be:

| Year | Cash-inflows | | P.V. Factor |
	A (₹)	B (₹)	@15%
1	1,00,000	2,00,000	0.87

2	1,50,000	2,10,000	0.76
3	1,80,000	1,80,000	0.66
4	2,00,000	1,70,000	0.57
5	1,70,000	40,000	0.50
Salvage value at the end of Year 5	50,000	60,000	

The targeted return on capital is 15%.
Based on Profitability Index Criterion, advise the company on which machine should be taken up by it.

Question #6	PTP D22	Ans:	(i) 1,71,300; (ii) 2.855 yr (iii) 12%; (iv) ₹ 10,963

Given below are the data on a capital project 'M'

Annual Cost Saving	₹ 60,000	Profitability index	1.064
Useful Life	4 years	Salvage value	0
Internal Rate of Return	15%		

You are required to calculate for this project M:
  (i)   Cost of Project
  (ii)   Payback Period
  (iii)   Cost of Capital
  (iv)   Net Present Value

Question #7	PTP D23	Ans:	NPV: (₹ 1.193L)

ENGON Ltd., is considering the purchase of a new computer system for its research and development division, which would cost ₹ 35 lakh. The operation and maintenance costs (excluding depredation) are expected to be ₹ 7 lakh per annum. It is estimated that the useful life of the System would be 6 years, at the end of which the disposal value is expected to be ₹ 1 lakh.

The tangible benefits expected from the system in the form of reduction in design and draftsmanship costs would be ₹ 12 lakh per annum. The disposal of used drawing and drawing office equipment and furniture initially is anticipated to net ₹ 9 lakh.

As Capital expenditure in research and development, the proposal would attract a 100 per cent write-off for tax purposes. The gains arising from disposal of used assets may be considered tax-free. The Corporate tax rate is 35%. The average cost of capital of the company is 12 per cent. Ignore tax on Salvage value.

(Calculation should be made up to three decimal Points)

Given [PVIF (12%, 6 years) = 0.507 and PVIFA (12%, 6 years) = 4.111]

Required:
  (i)   Assess the Net Present Value (incremental) from the computer System.
  (ii)   As a financial adviser, what would your recommendation to the Company in respect of purchase of Computer System.

Question #8 | **PTP J23** | *Ans:* | *A, C, D & F; NPV: ₹ 59.4L*

HONEY Ltd. having limited funds of ₹ 10,10,000 and cost of capital 10% is evaluating the desirability of following projects having useful life of 10 years:

Project	A	B	C	D	E	F
Initial Cash Outflows (₹)	50,000	1,00,000	1,50,000	2,00,000	2,50,000	6,00,000
Net Present Value (₹)	4,50,000	8,00,000	10,50,000	12,00,000	13,75,000	32,40,000
Ranking as per NPV	6	5	4	3	2	1
Ranking as per Profitability Index	1	2	3	4	5	6

Required:

(i) Which projects should be selected assuming that the projects are divisible and there is no alternative use of money allocated for capital budgeting.

(ii) Which projects should be selected assuming that the projects are indivisible and unutilised funds can be invested for a period of 10 years at a risk-free interest rate of 5%.

Note: The Compound Value of ₹ 1 @5% at the end of the 10th year is ₹ 1.629 and the Present Value of ₹ 1 @10% at the end of the 10th year is ₹ 0.386.

Question #9 | **PTP J23/D23** | *Ans:* | *X: ₹ 2,10,413; Y: ₹ 1,49,608*

Nona Ltd. provides you with the following information:

Particulars	Machine X	Machine Y
1. Purchase Price of Machine	₹ 6,00,000	₹ 10,00,000
2. Working Capital	₹ 3,00,000	₹ 5,00,000
3. Useful Life of the machine	5 years	8 years
4. Estimated Salvage Value at the end of useful life	₹ 1,00,000	₹ 2,00,000
5. Actual Salvage Value at the end of useful life	₹ 1,20,000	₹ 80,000
6. Method of Depreciation	Straight line	Straight line
7. Tax Rate	30%	30%
8. Annual Earning before Tax	₹ 4,00,000	₹ 4,00,000
9. Annuity Factor for 5/8 yrs @ 10%	3.791	5.335
10. PV Factor for 5th/8th year @ 10%	0.621	0.467

Required: Which of the above machines should be purchased?

Question #10 | **PTP D23** | *Ans:* | *EAV: ₹11,34,261; ₹12,70,589*

A company has to replace one of its machines, which has become unserviceable. Two options are available to the company:
(i) A more expensive machine (Premium) with 12 years life.
(ii) A less expensive machine (Standard) with 6 years life.

If Standard machine is chosen, it will be replaced at the end of 6 years by another Standard machine. The pattern of maintenance, running costs and prices is as under:

Particulars	Premium (₹)	Standard (₹)
Purchase price	40,00,000	28,00,000
Scarp value at end of life	6,00,000	6,00,000
Overhauling is due at the end of	8th Year	4th Year
Overhauling cost	8,00,000	4,00,000
Annual repairing expenses	4,00,000	5,60,000

Cost of capital is 14%.

You are required to recommend which of the machines should be purchased. Given, Present Value Interest Factor, PVIF (14%)

Year	4	6	8	12
PV Factor	0.5921	0.4556	0.3506	0.2076

Present Value Interest Factor for an Annuity, PVIFA (14%)

Year	1 to 6 Years	1 to 12 Years
PV Factor	3.8899	5.6600

Question #11 **PTP D23** *Ans:* *NPV: ₹ 21,820*

Company A wants to invest in a project, the life of which is expected to be 4 years. The actual net profit is expected to be ₹ 20,000 after charging yearly depreciation of ₹ 16,000 in order to write-off the capital cost of ₹ 64,000. Out of the capital cost, ₹ 40,000 is payable immediately (Year 0) and the balance in the next year end. Stock amounting to ₹ 12,000 (to be invested in year 0) will be required throughout the project and for debtors a further sum of ₹ 16,000 will have to be invested at the end of year 1. The working capital will be recouped at the end of year 5. It is expected that the machinery will fetch a scrap value of ₹ 4,000 at the end of 4th year. Income tax is payable @ 40% and the Depreciation equals the taxation writing down allowances of 25% per annum. Income tax is paid after 9 months after the end of the year when profit is made. The residual value of ₹ 4,000 will also bear tax @ 40%. Since the tax paid is in the next year and the working capital is recouped in the fifth-year cash inflow, calculations will be required up to 5 years.

Taking discount factor of 10%, calculate NPV of the project and give your comments regarding its acceptability.

PV of ₹ 1.00 at 10% p.a.

Year	1	2	3	4	5
PV	0.9091	0.8264	0.7513	0.6830	0.6209

| **Question #12** | **PTP J24** | | *Ans:* | *Payback: 3.52 yrs; DP: 4.77 yrs* |

C Ltd. is considering a proposal of installing a drying equipment. The equipment would involve a cash outlay of ₹ 12,00,000 and net working capital of ₹ 1,60,000. The expected life of the project is 5 years without any salvage value. Assume that C Ltd. is allowed to charge depreciation on straight-line basis for income-tax purpose. The estimated before-tax cash inflows are given below:

Year	1	2	3	4	5
Before-tax cash-inflows (₹ '000)	480	550	420	360	320

The applicable income-tax rate for C Ltd. is 35%. C Ltd.'s opportunity cost of capital is 12% p.a. The management has determined that acceptable payback period and discounted payback period for the equipment are 3.6 years and 4.5 years respectively.
Advise the management on the proposal based on payback period and discounted payback period.

Year	1	2	3	4	5
PVIF (12%)	0.893	0.797	0.712	0.636	0.567

| **Question #13** | **PTP J24** | | *Ans:* | *₹ 399.20* |

Boldwire Co. Ltd. produces a sophisticated integrated circuit chip. Last year, the research and development department of the company designed and prototyped an improved model of the chip. The marketing department of the company made a forecast that it would be able to sell 8,000 units of the new chip in the next year. However, additional investment would be required to buy and install new machinery for production. The cost of the new machinery would be ₹ 25,00,000 and that would have an economic life of 4 years. The salvage value of the machine at the end of four years would be Nil. The marketing department also informed that during the period of four years there would be certain advertising and promotional expenditure necessary for selling the new chips. The details of such expenses are given below:

Year	1	2	3	4
Expenses (₹)				
Advertisement	1,00,000	75,000	60,000	30,000
Promotion	50,000	75,000	90,000	1,20,000

The variable costs of producing and selling each unit of the new chip would be ₹ 250. Additional fixed operating costs to be incurred because of this new product are budgeted at ₹ 75,000 per year. A discounted return of 15% (after tax) on investments in the new product is contemplated by the management. Advise as to what should be the selling price per unit of the new chip that may be fixed with a view to obtaining the desired return on investment. The tax rate of the company is 40% and depreciation is on straight line basis.

(Note: The present value of annuity of ₹ 1.00 received or paid throughout the period of four years in the future at 15% is 3.0079)

Question #14   **PTP D24**   Ans: *NPV: ₹ 1,12,237*

A project, requiring initial investment of ₹ 5,00,000 in creating a fixed facility, ensures net incremental inflow of ₹ 1,50,000 per annum before deduction of depreciation and tax. The fixed facility is likely to have an economic life of five years with scrap value of ₹ 1,00,000 at the end. Depreciation is allowed on straight-line basis and marginal tax rate is 40%. The cost of capital is 10% p.a.

You are required to estimate the IRR of the project and advise the management on its acceptability.

Consider the following Present Value table:

Year	1	2	3	4	5
PVIF @ 10%	0.909	0.826	0.751	0.683	0.621
PVIF @ 11%	0.901	0.812	0.731	0.659	0.593
PVIF @ 12%	0.893	0.797	0.712	0.636	0.567

Question #15   **PTP D24**   Ans: *IRR: 11.75%*

From the following information, calculate Net Present Value of the following business proposal and suggest whether the proposal should be accepted or rejected:

Initial Investment in Fixed Assets	₹ 5,00,000
Initial Investment in Working Capital	₹ 1,00,000
Salvage Value of Fixed Assets after 3 years	₹ 2,00,000
Annual Cash inflows before tax	₹ 3,00,000
Income tax rate (on profit as well as capital gain)	30%
Cost of capital	18%

Depreciation is to be charged under WDV method @40%.
Present Values of Re. 1.00 at 18% are as follows:

Year	1	2	3
PVIF	0.8475	0.7182	0.6086

Question #16   **MQP J23**   Ans: *Not Given*

Projects X and Y are analyzed and you have determined the following parameters. Advice the investor on the choice of a project:

Particulars	Project X	Project Y
Investment	₹ 7 cr.	₹ 5 cr.
Project Life	8 years	10 years
Construction Period	3 years	3 years
Cost of Capital	15%	18%
N.P.V. @ 12%	₹ 3,700	₹ 4,565
N.P.V. @ 18%	₹ 325	₹ 325

I.R.R.	45 %	32%
Rate of Return	18 %	25 %
Payback	4 years	6years
B.E.P.	45%	30%
Profitability Index	1.76	1.35

Question #17	MQP J23	Ans:	(i) ₹ 13, ₹23, ₹ 33; (ii) ₹ 17.52, ₹ 26.76, ₹ 36.00

The Drew Furniture Company is considering the introduction of a new product line. Plant and inventory expansion equal to 50% of present asset levels will be necessary to handle the anticipated volume of the new product line. New capital will have to be obtained to finance the asset expansion. The following two proposals have been developed to provide the additional capital:

1. Raise ₹1,00,000 by issuing 10 years 12% bonds. This will change the capital structure from one with about 20% debt to one with almost 50% debt. The investment banking house estimates the price/earnings ratio, now 12 to 1, will be reduced to 10 to 1 if this method of financing is chosen.
2. Raise ₹1,00,000 by issuing new common stock. The investment banker believes that the stock can be issued to yield ₹33.33. The P/E ratio would remain at 12 to 1, if the stock were issued. The present market price is ₹36.

The company's most recent financial statements are as follows:
Balance sheet as on December 31, 2022

Liabilities	Amount (₹)	Assets	Amount (₹)
Common Stock	1,00,000	Plant and Equipment	1,35,000
5% Debt	40,000	Current Assets	65,000
Retained Earnings	60,000		
	2,00,000		2,00,000

Income Statement for the year ended December 31, 2022

Particulars	Amount (₹)
Sales	6,00,000
Less: Operating Costs	(5,38,000)
Operating Income	62,000
Less: Interest Charge	(2,000)
Net Income Before Taxes	60,000
Less: Income Taxes	(30,000)
Net Income	30,000

(i) The Vice President of Finance asks you to calculate the earnings per share and the market value of the stock (assuming the price/earnings ratio given are valid estimates) for the two proposals assuming total sales (including the new product line) of: (1) ₹4,00,000; (2) ₹6,00,000; and (3) ₹ 8,00,000. Costs exclusive of interest and taxes are about 90% of sales.

(ii) Which proposal would you recommend? Your answer should indicate the criteria used to judge the alternatives.

Question #18   **MQP D23**   *Ans:* **NPV: ₹ 10,03,434, ₹ 21,26,985**

Annu Ltd. is examining two mutually exclusive investment proposals. The management uses Net Present Value Method to evaluate new investment proposals. Depreciation is charged using Straight-line Method. Other details relating to these proposals are:

Particulars	Proposal X	Proposal Y
Annual Profit before tax (₹)	13,00,000	24,50,000
Cost of the Project (₹)	90,00,000	180,00,000
Salvage Value (₹)	1,20,000	1,50,000
Working Life	4 years	5 Years
Cost of capital	10%	10%
Corporate Tax Rate	30%	30%

The present value of ₹1 at 10% discount rates at the end of first, second, third, fourth and fifth year are 0.9091; 0.8264; 0.7513; and 0.6209 respectively.
You are required to advise the company on which proposal should be taken up by it.

Question #19   **MQP D23/J23**   *Ans:* **DPP: 3 yrs**

Assume a business that is considering a given project. Below are some selected data from the discounted cash flow model created by the company's financial analysts:
A project requires an initial investment of ₹1,91,315 and is expected to generate the following net cash inflows:

Year 1 (2019): ₹95,000; Year 2 (2020): ₹80,000; Year 3 (2021): ₹60,000; Year 4 (2022): ₹55,000. Assess the discounted payback period of the project if the appropriate discount rate for this project is 12%.

Question #20   **MQP D23**   *Ans:* **(i) 5.263 yrs, 5.454 yrs: (ii) 13.776, 12.873**

United Industries Ltd. has an investment budget of ₹ 100 lakhs for 2023-24. It has short listed two projects A and B after completing the market and technical appraisals. The management wants to complete the financial appraisal before making the investment. Further particulars regarding the two projects are given below:

Particulars	(₹ Lakhs)	
	A	B
Investment required	100	90
Average annual cash inflow before depreciation and tax (estimate)	28	24

Salvage value: Nil for both projects. Estimate life – 10 years for both projects.
The company follows straight line method of charging depreciation. Its tax rate is 50%.
You are required to calculate:
  i)   Payback period and
  ii)   IRR for the 2 projects.
Note: P.V of an annuity of ₹ 1 for ten years at different discount rate is given below:

Rate %	10	11	12	13	14	15
Annuity Value of return	6.1446	5.8892	5.6502	5.4262	5.2161	5.0188

Question #21 **MQP D23** Ans: ₹ 1,295

A project requires an initial investment of ₹ 2,25,000 and is expected to generate the following
net cash inflows:
Year 1 (2019): ₹ 95,000;
Year 2 (2020): ₹ 80,000;
Year 3 (2021): ₹ 60,000;
Year 4 (2022): ₹ 55,000.
Assess and compute net present value of the project if the minimum desired rate of return is 12%.

Question #22 **MQP D24/D23** Ans: ₹ 400

Electromatic Excellers Ltd. specialise in the manufacture of novel transistors. They have recently developed technology to design a new radio transistor capable of being used as an emergency lamp also. They are quite confident of selling all the 8,000 units that they would be making in a year. The capital equipment that would be required will cost ₹25 lakhs. It will have an economic life of 4 years and no significant terminal salvage value.

During each of the first four years' promotional expenses are planned as under:

	1	2	3	4
Advertisement	1,00,000	75,000	60,000	30,000
Others	50,000	75,000	90,000	1,20,000

Variable cost of production and selling expenses: ₹250 per unit

Additional fixed operating costs incurred because of this new product are budgeted at ₹75,000 per year. The company's profit goals call for a discounted rate of return of 15% after taxes on investments on new products. The income tax rate on an average works out to 40%. You can assume that the straight-line method of depreciation will be used for tax and reporting. Assess the initial selling price per unit of the product that may be fixed for obtaining the desired rate of return on investment. Present value of annuity of ₹1 received or paid in a steady stream throughout 4 years in the future at 15% is 3.0079.

Question #23 **MQP D24/J23** Ans: NPV- ₹ 52,230

A firm proposes to market a cheaper variety of its existing brand to be sold for ₹20 per unit, estimated product-life being five years. The sales volume for the five years has been estimated to be 30,000 units for the first year, 40,000 units for each of the next two years and 20,000 units for each of the last two years. The variable cost p.u. is ₹10. Production of the cheapest brand will entail an initial expenditure of ₹4,50,000 in

purchasing and installing a new plant with estimated economic life of five years and scrap value of ₹50,000. The fixed cost of ₹2,00,000 per annum including depreciation on the plant on straight line basis will be needed for producing and marketing the cheaper brand. Introduction of this cheaper variety is also likely to have an adverse impact on the demand of the existing dearer brand resulting in loss of contribution estimated at ₹20,000 per annum.

Assuming cost of Capital to be 10% and marginal tax rate to be 40%, you are required to evaluate proposal and give your reasoned recommendation as to its acceptance or rejection. The PV factors at 10% for five years are 0.909, 0.826, 0.751, 0.683 and 0.62.

Question #24	MQP D24	Ans:	2.25 yrs; 20%; 40%; 1,08,193 1.54; 30.8602%; 20%

A limited company is considering investing a project requiring a capital outlay of 2,00,000. Forecast for annual income after depreciation but before tax is as follows:

Year	(₹)
1	1,00,000
2	1,00,000
3	80,000
4	80,000
5	40,000

Depreciation may be taken as 20% on original cost and taxation at 50% of net income. You are required to evaluate the project according to each of the following methods:
1. Payback period method
2. Rate of return on original investment method
3. Rate of return on average investment method
4. Discounted cash flow method taking cost of capital as 10%
5. Net present value index method
6. Internal rate of return method.
7. Modified internal rate of return method.

Question #25	MQP D24	Ans:	NPV – ₹ 2,70,907

A plastic manufacturer has under consideration the proposal of production of high-quality plastic bowl. The necessary equipment to manufacture the bowl would cost ₹ 2 lakhs and would last 5 years. The tax relevant rate of depreciation is 20% on written down value. There is no other asset in the block. The expected salvage is ₹ 20,000. The bowl can be sold at ₹ 4 each. Regardless of the level of production, the manufacturer will incur cash cost ₹ 50,000 each year if the project is undertaken. The overhead costs allocated to this new line would be ₹ 10,000. The variable costs are estimated at ₹ 2 per bowl. The manufacturer estimates it will sell about 1,50,000 bowl per year; the tax rate is 35%.

Advice the management whether the proposed equipment should be purchased or not. Assume 20% cost of capital and additional working capital requirement, ₹1,00,000.

Capital Budgeting

Q1

Project A

PV of Annuity of ₹ 3,50,000 for 5 years at 4% rate of discount —

3,50,000 × 4,452 = ₹ 15,58,200

NPV = ₹ 15,58, 200 – ₹ 15,00,000 = ₹ 58,200

Project B

PV of Annuity of ₹ 4,00,000 for 5 years at 8% rate of discount-

4,00,000 × 3.993 =15,97,200

NPV = ₹ 15,97,200 – ₹ 15,00,000 = ₹ 97,200

Project C

PV of Annuity of ₹ 5,00,000 for 5 years at 10% rate of discount-

5,00,000 × 3.791 - 18,95,500

NPV = ₹18,95,500 - ₹ 15,00,000 = ₹ 3,95,500

Accept Project C

Q2

Cash Outflows:

Particulars	₹
Price of new machine	4,40,000
Less: Sale proceeds of existing machine	1,50,000
Less: Tax savings on loss of the sale of existing machine [0.35 × (₹ 2,00,000, Book Value – ₹ 1,50,000, Sale Value)]	17,500
Less: Modifications avoided if the new machine is bought	2,00,000
Net Cash Outflows	72,500

Cash Inflows (annual savings):

Particulars	Amount Before Tax (₹)	Amount After Tax (₹)
Cost savings	25,000	16,250
Differential depreciation (1,10,000 – 1,00,000)	10,000	3,500
Total Cash advantage per year		19,750
(x) PV Factor		(x) 2.855
PF of future savings from buying new machine		56,386
Cash flow required		72,500
Negative PV favouring modifying machine		(16,114)

Recommendation: The old machine should be modified.

Q3

Financial Evaluation of Project A & Project B

	Project A (Rs.)	Project B (Rs.)	Incremental Cash flows (Rs.)
Cash outflows	10,00,0000	15,00,0000	5,00,000
Cash running expenses	3,50,000	2,00,000	1,50,000
Depreciation	1,20,000	1,70,000	(50,000)
Total saving			1,00,000
Less: Tax @50%			(50,000)
Saving after Tax			50,000
Add: Depreciation (not being cash outflow)			50,000
Net Saving			1,00,000
Salvage value at the end of year 8	40,000	1,40,000	1,00,000
Present value of annual saving for 8 years=PV of annuity × net savings for 8 years = 1,00,000 × 5.335 Present value of incremental salvage value at end of year 8 = 0.467 × 1,00,000			5,33,500 46,700
Total			5,80,200
Less: Cash outflow (incremental)			5,00,000
Net present value (incremental)			80,200

Recommendation:

Since Project B has positive NPV over and above the NPV of Project A, Project B is recommended for acceptance.

Note: Working for depreciation:

Project A: (**Rs.**10,00,000 – 40,000)/8 years = **Rs.**1,20,000

Project B: **Rs.** (15,00,000 –1,40,000)/8 years = **Rs.** 1,70,000

Q4

Appraisal of Replacement decision Under NPV Method:

Calculation of Present Value of Net Cash outflow:

(Amount in ₹)

Cost of Machine B		2,50,000
Less : Sale proceeds of Machine A	1,00,000	
Cost of dismantling and removal	(30,000)	(70,000)
Net outflow		1,80,000

Calculation of Present Value of Incremental Cash inflow:

(Amount in ₹)

Particulars	Machine-A	Machine-B	Incremental
Sales P.A (units) Sales P.A (1,50,000 × 8)	1,50,000 12,00,000	1,50,000 12,00,000	-
Less : Expenditures :			
Operating Cost	2,00,000	1,50,000	50,000
Fixed Cost	4,50,000	4,50,000	-
Net Cash inflow			50,000
Present Value	50,000 ×3.433		1,71,650
Less: Out flow			(1,80,000)
Net Present Value			(8,350)

Decision: As NPV of Machine B is negative, the replacement decision is not financially feasible. So the Company should not replace the Machine A.

Q5

(i) Expenditure at year zero

Particulars	Machine A (₹) in Lakh	Machine B (₹) in Lakh
Cost of Machine	5.00	5.00
Cost of Utilities	1.00	1.80
Salvage of old machine	(1.00)	(1.00)
	5.00	5.80

(ii) Discounted value of Cash inflows

Amount (₹) in Lakh

Year	NPV Factor@15%	Machine A		Machine B	
		Cash inflows	Discounted value of inflows	Cash inflows	Discounted value of inflows
1	0.87	1.00	0.87	2.00	1.74
2	0.76	1.50	1.14	2.10	1.60
3	0.66	1.80	1.19	1.80	1.19
4	0.57	2.00	1.14	1.70	0.97
5	0.50	1.70	0.85	0.40	0.20
Salvage	0.50	0.50	0.25	0.60	0.30
Present value of Net Cash Inflow			**5.44**		**6.00**

$$\text{Profitability Index} = \frac{\text{Sum of PV of net Cash Inflow}}{\text{Initial Cash Outflow}}$$

Machine A $= \dfrac{₹\,5.44\,\text{lakh}}{₹\,5.00\,\text{lakh}} = 1.088$

Machine B $= \dfrac{₹\,6.00\,\text{lakh}}{₹\,5.80\,\text{lakh}} = 1.034$

Advice: Since the profitability Index is higher in the case of Machine A, it is better to choose Machine - A.

Q6

(i) Cost of the project = Annual cost savings × PVIFA(IRR,n)

= 60,000 × PVIFA(15%,4)

= 60,000 × 2.855

= ₹ 1,71,300.

(ii) Payback period = $\dfrac{171300}{60000}$ = 2.855 years.

(iii) PV of Total CFs = Cost of Project × PI

= 171300 × 1.064

= 1,82,263

Let, Cost of Capital be 12%.

∴ PV of Cashinflows = 60,000 × PVIFA (12%,4)

= 182,241

Therefore, cost of capital = 12%.

(iv) NPV = 182,263 − 171300 = ₹ 10,963.

Q7

Computation of Net Present Value (NPV) :
(lakh)

Particulars	CF (₹)	PVF@12%	PV of CFs (₹)
Tangible Benefit [12×0.65 = 7.80]	7.80	4.111	32.066
Less: Operations Cost pa. [7×0.65 = 4.55 lakh]	(4.55)	4.111	(18.705)
Add: Salvage	1	0.507	0.507
Less: Cost of new system	(35)	1	(35)
Add: Tax adv of writing off [35×0.35 = 12.25]	12.25	0.893	10.939
Add: Office Eqt Sold	9	1	9
NET PRESENT VALUE			**(1.193)**

Q8

Selection of Projects on the basis of PI Ranking when Projects are Divisible

Project	Investment	PI Ranking	NPV
A	50,000	1	4,50,000
B	1,00,000	2	8,00,000
C	1,50,000	3	10,50,000
D	2,00,000	4	12,00,000
E	2,50,000	5	13,75,000
F	2,60,000	6	14,04,000
	10,10,000		62,79,000

Selection of Projects when Projects are Indivisible

Combination 1

Projects	Investment	NPV Ranking	NPV
F	6,00,000	1	32,40,000
E	2,50,000	2	13,75,000
C	1,50,000	4	10,50,000
	10,00,000		56,65,000

Combination 2

Project	Investment	NPV
A	50,000	4,50,000
C	1,50,000	10,50,000
D	2,00,000	12,00,000
F	6,00,000	32,40,000
	10,00,000	59,40,000

Recommendation: The company is advised to undertake projects A, C, D and F since the NPV of A, C, D and F is more than the NPV of any other combination and ₹10,000 will remain unspent

Q9

Workings:

1. Depreciation

$$\text{Machine X} = \frac{600,000 - 100,000}{5} = 100,000.$$

$$\text{Machine Y} = \frac{10,00,000 - 200,000}{8} = 100,000.$$

2. Computation of Annual CFs:

Particulars	Machine X	Machine Y
PBT	4,00,000	4,00,000
(-) Tax @ 30%	(1,20,000)	(1,20,000)
(+) Depreciation	1,00,000	1,00,000
Annual CF	3,80,000	3,80,000

3. After-tax Salvage:

$$\text{Machine X} = 1,20,000 - (1,20,000 - 1,00,000)\,30\%$$
$$= ₹ 1,14,000.$$

$$\text{Machine Y} = ₹ 80,000.$$

Computation of NPV & EAC:

Particulars	Machine X	Machine Y
PV of ACF	14,40,580	20,27,300
Add: PV of Salvage		
X: 114000 × 0.621	70,794	
Y: 80000 × 0.467		37,360
Add: PV of Working Cap.	1,86,300	2,33,500
	16,97,674	22,98,160
Less: Initial Outlay	(9,00,000)	(15,00,000)
Net Present Value	7,97,674	7,98,160
EACF	2,10,413	1,49,608
	(Better)	

Q10

Computation of EACF (Premium Machine):

Particulars	CF	Disc factor	PV of CF
Purchase Cost	40,00,000	1	40,00,000
Add: Overhead Cost	8,00,000	0.3506	2,80,480
Add: Annual Repairs	4,00,000	5.66	22,64,000
Less: Scrap Value	(6,00,000)	0.2076	(1,24,560)
	PV of Total Costs		64,19,920
	PVIFA		5.66
	EACF = $\frac{PV \text{ of } TC}{PVIFA}$		11,34,261

Computation of EACF (Standard Machine):

Particulars	CF	PVF	PU of CF
Purchase Price	28,00,000	1	28,00,000
Add: Overhead	4,00,000	0.5921	2,36,840
Add: Annual Repairs	5,60,000	3.889	21,77,840
Less: Scrap	(6,00,000)	0.4556	(2,73,360)
	PV of Total Cost		49,41,320
	PVIFA		3.889
	EACF = $\frac{PV \text{ of } TC}{PVIFA}$		12,70,589

Conclusion: Premium Machine should be selected.

Q.11

Computation of NPV of Project:

Particulars	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5
Capital Exp	(40,000)	(24,000)				
Working Cap.	(12,000)	(16,000)				
Net Profit			20,000	20,000	20,000	20,000
Depreciation (added back)			16,000	16,000	16,000	16,000
Tax			(8,000)	(8,000)	(8,000)	(8,000)
Salvage					4,000	
Tax on Salvage						(1,600)
Recovery of W/C						28,000
Total CF	(52,000)	(4,000)	28,000	28,000	32,000	18,400
PVF @10%	1	0.9091	0.8264	0.7513	0.683	0.6209
PV of CFs	(52,000)	(3,636)	23,139	21,036	21,856	11,425

∴ Net Present Value = ₹ 21,820

Q.12

Computation of CFs:

Year	CFBT	CF = CFBT(1-t)+DTS	Cumm. CF	PVF @12%	PV of CFs (₹)	Cumm. PV(₹)
1	480	480×0.65 + 240×0.35 = 312+84 = 396	396	0.893	353.628	353.628
2	550	550×0.65+84 = 441.5	837.5	0.797	351.876	705.504
3	420	420×0.65+84 = 357	1194.5	0.712	254.184	959.688
4	360	360×0.65+84 = 318	1512.5	0.636	202.248	1161.936
5	320	320×0.65+84 = 292	1804.5	0.567	256.284	1418.220

Payback = 3.52 years.
Disc. Payback = 4.77 years.

Q13

Let, SP be 'x'

$$\therefore \text{Contribution} = (x - 250) \times 8,000 \text{ units}$$
$$= 8000x - 20,00,000$$

also, Total fixed costs are as follows:

Year	₹	
1	100000 + 50,000 + 75,000	= 2,25,000
2	75000 + 75000 + 75000	= 2,25,000
3	60000 + 90000 + 75000	= 2,25,000
4	30000 + 120000 + 75000	= 2,25,000

and, Depreciation p.a. $= \dfrac{25,00,000 - 0}{4} = 6,25,000$.

$$\therefore \text{Annual cf} = (8000x - 20,00,000 - 2,25,000 - 625000)(1 - 0.4)$$
$$+ 625,000$$

$$= 4800x - 10,85,000$$

$$\therefore \text{PV of ACF @ ROI} = \text{Capital Investment}$$
$$\text{or, } (4800x - 10,85,000) \times 3.0079 = 25,00,000.$$
$$\text{or, } x = 399.20$$

Q14

Initial Cash Out Flow

Particulars	Amount (₹)
Fixed Assets	5,00,000
Working Capital	1,00,000
Total	6,00,000

Annual Cash Flows

Year	CFBT	Depreciation	Taxable Profit	Tax @ 30%	CFAT	PVIF	PV @ 18%
1	3,00,000	2,00,000	1,00,000	30,000	2,70,000	0.8475	2,28,825
2	3,00,000	1,20,000	1,80,000	54,000	2,46,000	0.7182	1,76,677
3	3,00,000	72,000	2,28,000	68,400	2,31,600	0.6086	1,40,952
		3,92,000					5,46,454

Terminal Cash Flows

Particulars	₹
Salvage Value	2,00,000
Tax on Capital Gain	-27,600
Working Capital	1,00,000
Total	2,72,400
PVIF (18% 3rd Year)	0.6086
Present Value	1,65,783

WDV = 5,00,000 – 3,92,000 = 1,08,000

Net Present Value = (5,46,454 + 1,65,783) - 6,00,000 = ₹ 1,12,237

Decision: NPV is positive and hence the proposal should be accepted.

CFAT (in ₹)

Year	CFBT	Depreciation	Taxable Profit	Tax @40%	CFAT
1	150000	80000	70000	28000	122000
2	150000	80000	70000	28000	122000
3	150000	80000	70000	28000	122000
4	150000	80000	70000	28000	122000
5	150000	80000	70000	28000	222000 *

*(122000 + Scrap Value 100000)

Calculation for IRR

Year	CFAT	PVIF (10%)	PV	PVIF (11%)	PV	PVIF (12%)	PV
1	122000	0.909	110898	0.901	109922	0.893	108946
2	122000	0.826	100772	0.812	99064	0.797	97234
3	122000	0.751	91622	0.731	89182	0.712	86864
4	122000	0.683	83326	0.659	80398	0.636	77592
5	222000	0.621	137862	0.593	131646	0.567	125874
Total PV			524480		510212		496510
Initial Investment			500000		500000		500000
NPV			24480		10212		- 3490

So, IRR (where NPV = 0) lies in between 11% and 12%.

Applying simple interpolation, we get,

IRR=L + $\frac{P1-C0}{P1-P2}$ x D

If calculation is based on NPV :-		If calculation is based on Total PV :-
$\frac{IRR-11}{12-11} = \frac{10212-0}{10212-(-3490)}$	Or	$\frac{IRR-11}{12-11} = \frac{510212-500000}{510212-496510}$

IRR = 11.75%

Decision: Since IRR is higher than cost of capital, the project is acceptable.

Relative Ranking of Project X and Project Y

Particulars	Rank	
	Project X	**Project Y**
IRR	I	II
Rate of Return	II	I
Payback	I	II
Profitability Index	I	II
N.P.V. @ 12%	II	I
N.P.V. @ 18%	Equal	Equal
B.E.P.	II	I
Cost of Capital	I	II

Analysis – The major criteria i.e. IRR, Payback and Profitability Index in which Project X is ranking first and hence it could be selected.

Q17

(i) Proposal 1 - Raise ₹1,00,000 by issuing 10 years 12% bonds for the year ended 31.12.2022

Sales (₹)	4,00,000	6,00,000	8,00,000
Less: Operating Costs(₹)	(3,60,000)	(5,40,000)	(7,20,000)
Operating Income(₹)	40,000	60,000	80,000
Less: Interest Charge(₹)	(14,000)	(14,000)	(14,000)
Net Income Before Taxes(₹)	26,000	46,000	66,000
Less: Income Taxes(₹)	(13,000)	(23,000)	(33,000)
Net Income(₹)	13,000	23,000	33,000
Outstanding Shares = ₹ 30,000/3 = ₹10,000			
Earnings per share	₹ 1.30	₹ 2.30	₹3.30
Price/Earnings Ratio	10 times	10 times	10 times
Estimated Market Value	₹13	₹23	₹33

Proposal 2 - Raise ₹1,00,000 by issuing new common stock for the year ended 31.12.2022

Sales(₹)	4,00,000	6,00,000	8,00,000
Less: Operating Costs(₹)	(3,60,000)	(5,40,000)	(7,20,000)
Operating Income(₹)	40,000	60,000	80,000
Less: Interest Charge(₹)	(2,000)	(2,000)	(2,000)
Net Income Before Taxes(₹)	38,000	58,000	78,000
Less: Income Taxes(₹)	(19,000)	(29,000)	(39,000)
Net Income(₹)	13,000	23,000	33,000
Outstanding Shares = ₹1,00,000/ ₹ 33.33 +10,000 = 13,000 shares			
Earnings per share	₹ 1.46	₹ 2.23	₹3.00
Price/Earnings Ratio	12 times	12 times	12 times
Estimated Market Value	₹17.52	₹26.76	₹36.00

(ii) In the given situation the proposal 2 will be considered as best proposal as the estimated market price per share in all the three situations is higher than that under proposal 1. Both the objectives of maximization of wealth and maximization of earnings are being fulfilled under proposal 2.

Q18

Computation of Cfs :	Proposal X	Proposal Y
Annual Profit Before Tax	13,00,000	24,50,000
Less: tax @ 30%	3,90,000	7,35,000
Annual Profit After Tax	9,10,000	17,15,000
Add: Depreciation (Annual) Proposal X : $\dfrac{90,00,000 - 1,20,000}{4}$ Proposal Y: $\dfrac{1,80,00,000 - 1,50,000}{5}$	22,20,000 -	- 35,70,000
Annual Cash inflow	31,30,000	52,85,000
P. V. of ₹1 for 1 to 4 year	31,698	-
P. V. of ₹1 for 1 to 5 year	-	37,907
Present value of Annual Cash Inflows	99,21,474	2,00,33,850
Add: Present value of salvage value: Proposal X: 1,20,000 × 0.683 Proposal Y: 1,50,000 × 0.6209	81,960 -	- 93,135
Total Present value	1,00,03,434	2,01,26,985
Less: Initial outflow	90,00,000	1,80,00,000
Net Present Value	10,03,434	21,26,985

Advice: Proposal Y should be accepted as it gives higher net present value.

Q19

We can calculate the discounted payback period as follows:

Computation of DPBP

Period	Cash Inflows Amount (₹)	PVIF @ 12%	Present Value (₹)	Cumulative Present Value (₹)
Year 1 (2019)	95,000	0.893	84,835	84,835
Year 2 (2020)	80,000	0.797	63,760	1,48,595
Year 3 (2021)	60,000	0.712	42,720	1,91,315
Year 4 (2022)	55,000	0.636	34,980	2,26,295

In this case, we see that the project's payback period is 3 years.

Q20

W.N:- Cash Inflows

[₹ in lakhs]

	Project A	Project B
CIF before Depr. And Tax	28	24
(-) Depr. $\left(\frac{100}{10}\right)\left(\frac{90}{10}\right)$	10	9
PBT	18	15
(-) Tax @ 50%	9	7.5
PAT	9	7.5
(+) Dep	10	9
	19	16. 5
Cash outflow (or) cost	100	90
Payback period $\left(\frac{100}{19}\right)\left(\frac{90}{16.5}\right)$	5.263 years	5.454 years
	5 yrs 3.12m	5 years 5.44m
	5 yrs 3m 4d	5 year 5m 13d

IRR for project A:

As Inflows from project are uniform, then the

Cumulative DCG/ Annuity factor at IRR = $\dfrac{100l}{19l}$ = 5.263

From the given annuity table, 5.26 lies between the value 5.2161 and 5.4262 i.e., lies between 13% and 14%

P.V of CIF @ 13% = 5.4262 x 19l = 103.097l

P.V of CIF @ 14% = 5.2161 x 19l = 99.105l

IRR = lower rate + $\dfrac{\text{P.V of CIF @law rate} - \text{P.V.Co}}{\text{P.V.Of CIF @ lowrate} - \text{P.V of CIF @Highrate}}$ X Rage

= 13 + $\dfrac{103.097l - 100l}{103.097l - 99.105l}$ X1

= 13+ $\dfrac{3.097l}{3.992l}$

= 13 + 0.776

= 13.776

IRR of Project B:

Cumulative DCG/ Annuity factor at IRR = $\dfrac{90l}{16.5l}$ = 5.454

From the given annuity table, 5.454 lies between the value 5.4262 and 5.6502 i.e., lies between 12% and 13%

P.V of CIF @ 12% = 5.6502 x 16.5l = 93.228l

P.V of CIF @ 13% = 5.4262 x 16.5l = 89.532l

IRR = lower rate + $\dfrac{\text{P.V of CIF @law rate} - \text{P.V.Co}}{\text{P.V.Of CIF @ lowrate} - \text{P.V of CIF @Highrate}}$ X Rage

= 12 + $\dfrac{93.228l - 90l}{93.228l - 89.532l}$ X1

= 12+ $\dfrac{3.228l}{3.696l}$

= 12 + 0.873

= 12.873

Q21

Computation of PVECF

Period	Cash Inflows Amount (₹)	PVIF @ 12%	Present Value (₹)
Year 1 (2018)	95,000	0.893	84,835
Year 2 (2019)	80,000	0.797	63,760
Year 3 (2020)	60,000	0.712	42,720
Year 4 (2021)	55,000	0.636	34,980
PVECF (Total)			2,26,295

Here, Initial investment = ₹ 2,25,000.

Now, NPV = PVECF – Initial Investment

Where,

= ₹ (2,26,295 – 2,25,000)   = ₹ 1,295

The project seems attractive because its net present value is positive.

Q22

Computation of selling price in order to get a return of 15%

Let 'X' be the selling price, then sales will be 8000X

Sales	8000 X
Less: Variable Cost [8000 × 250]	20,00,000
Contribution	8000 X – 20,00,000
Less: Fixed Cost [Adv. + Others]	-1,50,000
Additional Fixed Cost	-75,000
Depreciation [25,00,000/4]	-6,25,000
PBT	8000X – 28,50,000
Less: Tax @ 40%	3200X – 11,40,000
PAT	4800X – 17,10,000
Add: Depreciation	6,25,000
Cash inflow after tax	4800X – 10,85,000

At required return at 15% -

PV of total cash inflow = outflow

[4,800 X – 10,85,000] x 3.0079 = 25,00,000

14,437.92 X – 32,63,572 = 25,00,000

14,437.92 X = 32,63,572 + 25,00,000

X = 32,63,572 + 25,00,000 14,437.92

= 399.19

Selling price must be at least ₹399.19= ₹400

Q23

Calculation of Cash Flow before Depreciation and Tax (CBDT)

Year	Sales (Units)	Sales @ ₹20 p.u. (₹)	Variable Cost @ ₹10 p.u. (₹)	Fixed Cost excluding Depreciation (₹)	CBDT (₹)
1	30,000	6,00,000	3,00,000	1,20,000	1,80,000
2	40,000	8,00,000	4,00,000	1,20,000	2,80,000
3	40,000	8,00,000	4,00,000	1,20,000	2,80,000
4	20,000	4,00,000	2,00,000	1,20,000	80,000
5	20,000	4,00,000	2,00,000	1,20,000	80,000

Note: Depreciation = ₹ (4,50,000 – 50,000) ÷ 5 = ₹ 80,000 p.a.

Fixed cost excluding depreciation = ₹ (2,00,000 – 80,000) = ₹1,20,000

Calculation of Cash Flow After Tax (CFAT)

Year	CBDT (₹)	Depreciation	Taxable Profit (₹)	Tax (₹)	CFAT excluding Loss of Contribution	Loss of Contribution (₹)	CFAT (₹)
(1)	(2)	(3)	(4)	(5)	(6)=(2)–(5)	(7)	(8) = (6)+(7)
1	1,80,000	80,000	1,00,000	40,000	1,40,000	20,000	1,20,000
2	2,80,000	80,000	2,00,000	80,000	2,00,000	20,000	1,80,000
3	2,80,000	80,000	2,00,000	80,000	2,00,000	20,000	1,80,000
4	80,000	80,000	Nil	Nil	80,000	20,000	60,000
5	80,000	80,000	Nil	Nil	80,000	20,000	1,10,000 *

*Note: The cash flow of fifth year includes ₹ 50,000 scrap value.

Calculation of NPV:

Year	CFAT (₹)	PVIF @ 10%	PV of CF
1	1,20,000	0.909	1,09,080
2	1,80,000	0.826	1,48,680
3	1,80,000	0.751	1,35,180
4	60,000	0.683	40,980
5	1,10,000	0.621	68,310
Total PV			5,02,230
(–) Initial Investment			4,50,000
NPV			52,230

Since NPV of the project is positive, it may be recommended.

Q24

Year	Profit before tax (₹)	Profit after tax @ 50% (₹)	Cash inflows after tax (₹)	Cumulative cash inflows (₹)	Discounting factor @ 10%	Present Value (₹)	Discounting factor @ 20%	Present value @20% (₹)	Discounting factor @ 30%	Present Value @30% (₹)	Discounting factor @ 32%	Present value @32% (₹)
1	1,00,000	50,000	90,000	90,000	0.9091	81,819	0.8333	74,997	0.7692	69,228	0.7576	68,184
2	1,00,000	50,000	90,000	1,80,000	0.8264	74,376	0.6944	62,496	0.5917	53,253	0.5739	51,651
3	80,000	40,000	80,000	2,60,000	0.7513	60,104	0.5787	46,296	0.4552	36,416	0.4348	34,784
4	80,000	40,000	80,000	3,40,000	0.6830	54,640	0.4823	38,584	0.3501	28,008	0.3294	26,352
5	40,000	20,000	60,000	4,00,000	0.6209	37,254	0.4019	24,114	0.2693	16,158	0.2495	14,970
						308193		246487		203063		195941

R.T.O

1. Payback Period Method

   Payback period = 2 + ₹ 20,000/₹ 80,000

   = 2.25 years (or) 2 years 3 months

2. Rate of Return on Original Investment Method

   ARR = (Average Profit after Tax / Investment) × 100

   = (` 40,000 / ₹ 2,00,000) × 100 = 20%

3. Rate of Return on Average Investment Method

   ARR = (Average Profit after Tax / Average Investment) × 100

   = ₹40,000 / ([₹ 2,00,000 + 0]/2) × 100 = 40%

4. Discounted Cash Flow Method taking Cost of Capital as 10%

Present value of cash inflows after tax (₹)	3,08,193
Less: Outflow (₹)	2,00,000
Net Present Value (₹)	1,08,193

5. Profitability Index

   Profitability Index = P.V of Cash Inflows / Cash Outflow

   = ₹ 3,08,193 / ₹ 2,00,000

   = 1.54

   Since PI is more than 1 the company can accept the project.

6. Internal Rate of Return Method

   IRR = L + [P1 – I / P1 – P2] × d

   = 30 + (2,03,063 – 2,00,000) / (2,03,063 – 1,95,941) × 2

   = 30 + 0.8602

   = 30.8602%

7. Modified Internal Rate of Return (MIRR)

	1	2	3	4	5	Total
Cash inflow after tax (₹)	90,000	90,000	90,000	90,000	90,000	---
Re-investment period	4	3	2	1	0	
Re-investment at	10%	10%	10%	10%	10%	
Future value factor	$(1.1)^4$	$(1.1)^3$	$(1.1)^2$	$(1.1)^1$	1	
Future value (₹)	1,31,769	1,19,790	96,800	88,000	60,000	4,96,359

At MIRR = 2,00,000 [1 + MIRR]5 = ₹ 4,96,359
= [1 + MIRR]5 = ₹ 4,96,359 /₹ 2,00,000 = 2.48
MIRR = 20%.

Q25

Cash outflows

Cost of production equipment	₹ 2,00,000
Additional working capital requirement	₹ 1,00,000
	₹ 3,00,000

Determination of CFAT and NPV:

Particulars	Years				
	1	2	3	4	5
Sales revenue (1,50,000 × 4)	6,00,000	6,00,000	6,00,000	6,00,000	6,00,000
Less : Costs					
Variable costs (1,50,000×2)	3,00,000	3,00,000	3,00,000	3,00,000	3,00,000
Additional fixed Costs	50,000	50,000	50,000	50,000	50,000
Depreciation (D)	40,000	32,000	25,600	20,480	Nil
Earnings before Taxes	2,10,000	2,18,000	2,24,400	2,29,520	2,50,000

Less : Taxes	73,500	76,300	78,540	80,332	87,500
Earning after taxes (EAT)	1,36,500	1,41,700	1,45,860	1,49,188	1,62,500
CFAT (EAT + D)	1,76,500	1,73,700	1,71,460	1,69,668	1,62,500
Add: Recovery of WC					1,00,000
Add: Salvage (SV)					20,000
Add: Tax benefit on short term capital loss (Note 1)					21,672
					3,04,172
Multiplied by PV factor	0.833	0.694	0.579	0.482	0.402
PV (CFAT × PV factor)	1,47,025	1,20,548	99,276	81,780	1,22,278
Total PV(t= 1-5)					5,70,907
Less: Cash Outflow					3,00,000
NPV					2,70,907

Note 1: {₹ 2,00,000-1,18,080 (accumulated depreciation) -₹ 20,000(SV)}×0.35 = ₹ 21,672.

Note 2: As the block consists of single asset, no depreciation is to be charged in the terminating year as the asset has been sold in the year.

Recommendation: The Company is advised to buy the proposed equipment.