

CAPITAL BUDGETING

Question 1

Nine Gems Ltd. has just installed Machine-R at a cost of Rs. 2,00,000. The machine has a five year life with no residual value. The annual volume of production is estimated at 1,50,000 units, which can be sold at Rs. 6 per unit. Annual operating costs are estimated at Rs. 2,00,000 (excluding depreciation) at this output level. Fixed costs are estimated at Rs. 3 per unit for the same level of production.

Nine Gems Ltd. has just come across another model called Machine-S capable of giving the same output at an annual operating cost of Rs. 1,80,000 (exclusive of depreciation). There will be no change in fixed costs. Capital cost of this machine is Rs. 2,50,000 and the estimated life is for five years with nil residual value.

The company has an offer for sale of Machine-R at Rs. 1,00,000. But the cost of dismantling and removal will amount to Rs. 30,000. As the company has not yet commenced operations, it wants to sell Machine –R and purchase Machine-S.

Nine Gems Ltd. will be a zero-tax company for seven years in view of several incentives and allowances available.

The cost of capital may be assumed at 14%. P.V. factors for five years are as follows:

Year	P.V. Factors
1	0.877
2	0.769
3	0.675
4	0.592
5	0.519

- (i) *Advise whether the company should opt for the replacement.*
- (ii) *Will there be any change in your view if Machine-R has not been installed but the company is in the process of selecting one or the other machine?*

Support your view with necessary workings.

(Final-Nov. 1996) (12 marks)

4.2 Financial Management

Answer

(i) Replacement of Machine –R

Incremental cash out flow

(i) Cash out flow on Machine –S	Rs. 2,50,000
Less: Sale Value of Machine –R	
Less : Cost of dismantling and removal (Rs. 1,00,000-Rs. 30,000)	<u>Rs. 70,000</u>
Net outflow	<u>Rs. 1,80,000</u>
Incremental cash flow from Machine-S	
Annual cash flow from Machine –S	Rs. 2,70,000
Annual cash flow from Machine –R	<u>Rs. 2,50,000</u>
Net incremental Cash in flow	<u>Rs. 20,000</u>

Present value of incremental cash in flows

$$\begin{aligned} &= \text{Rs. } 20,000 \times (0.877 + 0.769 + 0.675 + 0.592 + 0.519) \\ &= 20,000 \times 3.432 = \text{Rs. } 68,640 \end{aligned}$$

$$\begin{aligned} \text{NPV of Machine -S} &= \text{Rs. } 68,640 - \text{Rs. } 1,80,000 \\ &= (-) \text{Rs. } 1,11,360 \end{aligned}$$

Rs. 2,00,000 spent on Machine –R is a sunk cost and hence it is not relevant for deciding the replacement.

Decision: Since Net present value of Machine –S is in the negative, replacement is not advised.

If the company is in the process of selecting one of the two machines, the decision is to be made on the basis of independent evaluation of two machines by comparing their Net-present values.

(ii) Independent evaluation of Machine –R and Machine –S:

	<i>Machine –R</i>	<i>Machine –S</i>
Units produced	1,50,000	1,50,000
Selling price per unit (Rs.)	<u>6</u>	<u>6</u>
Sale value	9,00,000	9,00,000
Less: Operating Cost (exclusive of depreciation)	<u>2,00,000</u>	<u>1,80,000</u>
Contribution	7,00,000	7,20,000
Less: Fixed Cost	<u>4,50,000</u>	<u>4,50,000</u>
Annual cash flow	2,50,000	2,70,000

Present value of cash flows for five years	8,58,000	9,26,640
Cash Outflow	2,00,000	2,50,000
Net Present Value	<u>6,58,000</u>	<u>6,76,640</u>

As the NPV of cash in flow of Machine –S is higher than that of Machine –R, the choice should fall on machine –S.

Note: As the company is a zero tax company for seven years (Machine life in both cases is only for five years), depreciation and the tax effect on the same are not relevant for consideration.

Question 2

(a) Following are the data on a capital project being evaluated by the management of X Ltd.:

	Project M
Annual cost saving	Rs. 40,000
Useful life	4 years
I.R.R	15%
Profitability index (PI)	1,064
NPV	?
Cost of capital	?
Cost of project	?
Payback	?
Salvage value	0

Find the missing values considering the following table of discount factor only:

Discount factor	15%	14%	13%	12%
1 Year	0.869	0.877	0.885	0.893
2 Years	0.756	0.769	0.783	0.797
3 Years	0.658	0.675	0.693	0.712
4 Years	0.572	0.592	0.613	0.636
	2.855	2.913	2.974	3.038

(b) S Ltd. has Rs. 10,00,000 allocated for capital budgeting purposes. The following proposals and associated profitability indexes have been determined.

Project	Amount	Profitability Index
1	3,00,000	1.22
2	1,50,000	0.95
3	3,50,000	1.20
4	4,50,000	1.18
5	2,00,000	1.20
6	4,00,000	1.05

4.4 Financial Management

Which of the above investments should be undertaken? Assume that projects are indivisible and there is no alternative use of the money allocated for capital budgeting.

(Final-Nov. 1998) (12 + 8 marks)

Answer

(a) Cost of Project M

At 15% I.R.R., the sum total of cash inflows = Cost of the project i.e. Initial cash outlay 11
Given:

Annual cost saving	Rs. 40,000
Useful life	4 years
IRR	15%

Now, considering the discount factor table @ 15% cumulative present value of cash inflows for 4 years is 2.855

Therefore,

Total of cash inflows for 4 years for Project M is (Rs. 40,000 × 2.855) = Rs. 1,14,200

Hence, cost of the project is = Rs. 1,14,200

Payback period of the Project M

$$\begin{aligned}\text{Payback period} &= \frac{\text{Cost of the project}}{\text{Annual cost saving}} \\ &= \frac{\text{Rs. 1,14,200}}{40,000} \\ &= 2.855 \text{ or 2 years 11 months approximately}\end{aligned}$$

Cost of Capital

If the profitability index (PI) is 1, cash inflows and outflows would be equal. In this case, (PI) is 1.064. Therefore, cash inflows would be more by 0.64 than outflow.

$$\text{Probability index (PI)} = \frac{\text{Discounted cash inflows}}{\text{Cost of the Project}}$$

$$\text{or } 0.064 = \frac{\text{Discounted cash inflows}}{\text{Rs. 1,14,200}}$$

$$\text{or } 1.064 \times \text{Rs. 1,14,200} = \text{Rs. 1,21,509}$$

Hence discounted cash inflows = Rs. 1,21,509

Since, Annual cost saving is Rs. 40,000. Hence, cumulative discount factor for 4 years

$$= \frac{1,21,509}{40,000}$$

$$= 3.037725 \text{ or } 3.038$$

Considering the discount factor table at discount rate of 12%, the cumulative discount factor for 4 years is 3.038

Hence, the cost of capital is 12%

Net present value of the project

$$\begin{aligned} \text{N.P.V.} &= \text{Total present values of cash inflows} - \text{Cost of the project} \\ &= \text{Rs. } 1,21,509 - \text{Rs. } 1,14,200 \\ &= \text{Rs. } 7,309 \end{aligned}$$

(b) Statement showing ranking of projects on the basis of Profitability Index

Project	Amount (Rs.)	P.I.	Rank
1	3,00,000	1.22	1
2	1,50,000	0.95	5
3	3,50,000	1.20	2
4	4,50,000	1.18	3
5	2,00,000	1.20	2
6	4,00,000	1.05	4

Assuming that projects are indivisible and there is no alternative use of the money allocated for capital budgeting on the basis of P.I., the S Ltd. is advised to undertake investment in projects 1,3 and 5.

However, among the alternative projects the allocation should be made to the projects which adds the most to the shareholders wealth. The NPV method, by its definition, will always select such projects.

Statement showing NPV of the projects

Project	Amount (Rs.)	P.I.	Cash inflows of project (Rs.)	N.P.V. of project (Rs.)
(i)	(ii)	(iii)	(iv)=[(ii) × (iii)]	(v)=[(iv)-(ii)]
1	3,00,000	1.22	3,66,000	66,000
2	1,50,000	0.95	1,42,500	(-) 7,500
3	3,50,000	1.20	4,20,000	70,000
4	4,50,000	1.18	5,31,000	81,000
5	2,00,000	1.20	2,40,000	40,000
6	4,00,000	1.05	4,20,000	20,000

4.6 Financial Management

The allocation of funds to the projects 1,3 and 5 (as selected above on the basis of PI) will give NPV of Rs. 1,76,000 and Rs. 1,50,000 will remain unspent.

However, the NPV of the projects 3,4 and 5 is Rs. 1,91,000 which is more than the N.P.V. of projects 1,3 and 5. Further, by undertaking projects 3,4 and 5 no money will remain unspent. Therefore, S Ltd. is advised to undertake investments in projects 3,4 and 5.

Question 3

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 Rs. 50 lacs per annum for the next four years. The contract can be terminated upon installation of the aforesaid machine on payment of a compensation of Rs. 30 lacs 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 Rs. 200 lacs to be financed by a loan repayable in 4 equal installments commencing from the end of year 1. The interest rate is 16% per annum. At the end of the 4th year, the machine can be sold for Rs. 20 lacs and the cost of dismantling and removal will be Rs. 15 lacs.

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

	(Rs. In lacs)			
Year	1	2	3	4
Sales	322	322	418	418
Material consumption	30	40	85	85
Wages	75	75	85	100
Other expenses	40	45	54	70
Factory overheads	55	60	110	145
Depreciation (as per income tax rules)	50	38	28	21

Initial stock of materials required before commencement of the processing operations is Rs. 20 lacs 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 Rs. 55 lacs 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 Rs. 10 lacs per annum. Labour costs include wages of 40 workers, whose transfer to this process will reduce idle time payments of Rs. 15 lacs in the year 1 and Rs. 10 lacs in the year 2. Factory overheads include apportionment of general factory overheads except to the extent of insurance charges of Rs. 30 lacs per annum payable on this venture. The company's tax rate is 50%.

Present value factors for four years are as under:

Year	1	2	3	4
Present value factors	0.870	0.756	0.658	0.572

Advise the management on the desirability of installing the machine for processing the waste.
All calculations should form part of the answer. (Final-May 1999) (20 marks)

Answer

Statement of Incremental Profit

(Rs. in lacs)

Years	1	2	3	4
Sales :(A)	<u>322</u>	<u>322</u>	<u>418</u>	<u>418</u>
Material consumption	30	40	85	85
Wages	60	65	85	100
Other expenses	40	45	54	70
Factory overheads (insurance)	30	30	30	30
Loss of rent	10	10	10	10
Interest	32	24	16	8
Depreciation (as per income tax rules)	<u>50</u>	<u>38</u>	<u>28</u>	<u>21</u>
Total cost: (B)	<u>252</u>	<u>252</u>	<u>308</u>	<u>324</u>
Incremental profit (C)=(A)-(B)	70	70	110	94
Tax (50% of (C))	35	35	55	47

Statement of Incremental Cash Flows

(Rs. in lacs)

Years	0	1	2	3	4
Material stocks	(20)	(35)	-	-	-
Compensation for contract	(30)	-	-	-	-
Contract payment saved	-	50	50	50	50
Tax on contract payment	-	(25)	(25)	(25)	(25)
Incremental profit	-	70	70	110	94
Depreciation added back	-	50	38	28	21
Tax on profits	-	(35)	(35)	(55)	(47)
Loan repayment	-	(50)	(50)	(50)	(50)
Profit on sale of machinery (net)	-	-	-	-	5
Total incremental cash flows	(50)	25	48	58	48

4.8 Financial Management

Present value factor	1.00	0.870	0.756	0.658	0.572
Net present value of cash flows	(50)	21.75	36.288	38.164	27.456
Net present value	= Rs. 123.658 – Rs. 50 = 73.658 lacs.				

Advice: Since the net present value of cash flows is Rs. 73.658 lacs which is positive the management should install the machine for processing the waste.

Notes:

1. Material stock increases are taken in cash flows.
2. Idle time wages have also been considered
3. Apportioned factory overheads are not relevant only insurance charges of this project are relevant.
4. Interest calculated at 16% based on 4 equal instalments of loan repayment.
5. Sale of machinery- Net income after deducting removal expenses taken. Tax on Capital gains ignored.
6. Saving in contract payment and income tax there on considered in the cash flows.

Question 4

ABC Company Ltd. has been producing a chemical product by using machine Z for the last two years. Now the management of the company is thinking to replace this machine either by X or by Y machine. The following details are furnished to you:

	Z	X	Y
Book value (Rs.)	1,00,000	-	-
Resale value now (Rs.)	1,10,000	-	-
Purchase price (Rs.)	-	1,80,000	2,00,000
Annual fixed costs			
(including depreciation)(Rs.)	92,000	1,08,000	1,32,000
Variable running cost			
(including labour) per unit (Rs.)	3	1.50	2.50
Production per hour (unit)	8	8	12

You are also provided the following details:

Selling price per unit	(Rs.) 20
Cost of materials per unit	(Rs.) 10
Annual operating hours	2,000
Working life of each of the three machines (as from now)	5 years
Salvage value of machines Z is Rs. 10,000, X is Rs. 15,000 and Y is Rs. 18,000	

The company charges depreciation using straight line method. It is anticipated that an additional cost of Rs. 8,000 per annum would be incurred on special advertising to sell the

extra output of machine Y. Assume tax rate of 50% and cost of capital 10%. The present value of Rs. 1 to be received at the end of the year at 10% is as under:

Year	1	2	3	4	5
Present value	.909	.826	.751	.683	.621

Required: Using NPV method, you are required to analyse the feasibility of the proposal and make recommendations.
(Final-Nov. 1999) (14 marks)

Answer

ABC Company Ltd.

Computation of yearly cash inflow

Machine	Z	X	Y
Sales (units)	16,000	16,000	24,000
Selling price per unit (Rs.)	20	20	20
Sales: (A)	3,20,000	3,20,000	4,80,000
Less: Costs			
Variable running costs	48,000	24,000	60,000
Material cost	1,60,000	1,60,000	2,40,000
Annual fixed cost	<u>92,000</u>	<u>1,08,000</u>	<u>1,32,000</u>
	3,00,000	2,92,000	4,32,000
Additional cost (special advertising)	—	—	<u>8,000</u>
Total Cost: (B)	<u>3,00,000</u>	<u>2,92,000</u>	<u>4,40,000</u>
Profit before tax: (A)-(B)	20,000	28,000	40,000
Less: Tax (@ 50%)	<u>10,000</u>	<u>14,000</u>	<u>20,000</u>
Profit after tax	10,000	14,000	20,000
Add: Depreciation	<u>20,000</u>	<u>33,000</u>	<u>36,400</u>
Cash inflow	<u>30,000</u>	<u>47,000</u>	<u>56,400</u>

Computation of Cash Inflow in 5th Year

Machine	Z	X	Y
Cash inflow	30,000	47,000	56,400
Add: Salvage value of machines	<u>10,000</u>	<u>15,000</u>	<u>18,000</u>
Cash inflow	<u>40,000</u>	<u>62,000</u>	<u>74,400</u>

4.10 Financial Management

Computation of Net Present Value

Year	Machine	Z		X		Y	
	Discounting factor	Cash inflow Rs.	P.V. of Cash inflow Rs.	Cash inflow Rs.	P.V. of Cash inflow Rs.	Cash inflow Rs.	P.V. of Cash inflow Rs.
1	0.909	30,000	27,270	47,000	42,723	56,400	51,267.60
2	0.826	30,000	24,780	47,000	38,822	56,400	46,586.40
3	0.751	30,000	22,530	47,000	35,297	56,400	42,356.40
4	0.683	30,000	20,490	47,000	32,101	56,400	38,521.20
5	0.621	40,000	24,840	62,000	38,502	74,400	46,202.40
			1,19,910		1,87,445		2,24,934.00
Less: Purchase price			1,10,000		1,80,000		2,00,000.00
Net present value			9,910		7,445		24,934.00

Recommendations:

The net present value is higher in the case of machine Y. Therefore, it is advisable that the company should replace machine Z with machine Y.

However, as the cost of investment is not same for all machines, it would be better to base the decision on profitability index which is as under:

$$P.I. = \frac{P.V. \text{ of cash inflow}}{P.V. \text{ of cash outflow}}$$

$$\text{Machine Z} = \frac{1,19,910}{1,10,000} = 1.09$$

$$\text{Machine X} = \frac{1,87,445}{1,80,000} = 1.041$$

$$\text{Machine Y} = \frac{2,24,934}{2,00,000} = 1.12$$

Since the profitability index of machine Y is the highest therefore machine Z should be replaced by machine Y.

Question 5

- (a) Company X is forced to choose between two machines A and B. The two machines are designed differently, but have identical capacity and do exactly the same job. Machine A costs Rs. 1,50,000 and will last for 3 years. It costs Rs. 40,000 per year to run. Machine B is an 'economy' model costing only Rs. 1,00,000, but will last only for 2 years, and costs Rs. 60,000 per year to run. These are real cash flows. The costs are forecasted in

rupees of constant purchasing power. Ignore tax. Opportunity cost of capital is 10 per cent. Which machine company X should buy?

- (b) Company Y is operating an elderly machine that is expected to produce a net cash inflow of Rs. 40,000 in the coming year and Rs. 40,000 next year. Current salvage value is Rs. 80,000 and next year's value is Rs. 70,000. The machine can be replaced now with a new machine, which costs Rs. 1,50,000, but is much more efficient and will provide a cash inflow of Rs. 80,000 a year for 3 years. Company Y wants to know whether it should replace the equipment now or wait a year with the clear understanding that the new machine is the best of the available alternatives and that it in turn be replaced at the optimal point. Ignore tax. Take opportunity cost of capital as 10 percent. Advise with reasons.
(Final-May 2000) (12 + 8 marks)

Answer

(a) Statement showing the Evaluation of Two Machines

Machines	A	B
Purchase cost (Rs.): (i)	1,50,000	1,00,000
Life of machines (years)	3	2
Running cost of machine per year (Rs.): (ii)	40,000	60,000
Cumulative present value factor for 1-3 years @ 10%: (iii)	2.486	-
Cumulative present value factor for 1-2 years @ 10%: (iv)	-	1.735
Present value of running cost of machines (Rs.): (v)	99,440	1,04,100
	[(ii) × (iii)]	[(ii) × (iv)]
Cash outflow of machines (Rs.): (vi)=(i) +(v)	2,49,440	2,04,100
Equivalent present value of annual cash outflow	1,00,338	1,17,637
	[(vi)÷(iii)]	[(vi) ÷(iv)]

Decision: Company X should buy machine A since its equivalent cash outflow is less than machine B.

(b) Statement showing Present Value of Cash inflow of New Machine when it replaces Elderly Machine Now

Cash inflow of a new machine per year	Rs. 80,000
Cumulative present value for 1-3 years @ Rs. 10%	2.486
	<u>Rs.</u>
Present value of cash inflow for 3 years (Rs. 80,000 × 2,486)	1,98,880
	<u>Rs.</u>
Less: Cash Outflow	
Purchase cost of new machine	1,50,000
Less: Salvage value of old machine	<u>80,000</u>
N.P.V of cash inflow for 3 years	<u>1,28,880</u>
Equivalent annual net present value of cash	

4.12 Financial Management

inflow of new machine	$\left[\frac{\text{Rs. } 1,28,880}{2,486} \right]$	51,842
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Statement showing Present Value of Cash inflow of New machine when it replaces Elderly Machine Next Year

Cash inflow of new machine per year		Rs. 80,000
Cumulative present value of 1-3 years @10%		2.486
		Rs.
Present value of cash inflow for 3 years (Rs. 80,000 × 2,486)		1,98,880
	Rs.	
Less: Cash outflow		
Purchase cost of new machine	1,50,000	
Less: Salvage value of old machine	<u>70,000</u>	<u>80,000</u>
N.P.V. of cash inflow for 3 years		1,18,880

Advise: Since the equivalent annual cash inflow of new machine now and next year is more than cash inflow (Rs. 40,000) of an elderly machine the company Y is advised to replace the elderly machine now.

Company Y need not wait for the next year to replace the elderly machine since the equivalent annual cash inflow now is more than the next year's cash inflow.

Question 6

X Ltd. an existing profit-making company, is planning to introduce a new product with a projected life of 8 years. Initial equipment cost will be Rs. 120 lakhs and additional equipment costing Rs. 10 lakhs will be needed at the beginning of third year. At the end of the 8 years, the original equipment will have resale value equivalent to the cost of removal, but the additional equipment would be sold for Rs. 1 lakh. Working capital of Rs. 15 lakhs will be needed. The 100% capacity of the plant is of 4,00,000 units per annum, but the production and sales-volume expected are as under:

Year	Capacity in percentage
1	20
2	30
3-5	75
6-8	50

A sale price of Rs. 100 per unit with a profit volume ratio of 60% is likely to be obtained. Fixed Operating Cash Cost are likely to be Rs. 16 lakhs per annum. In addition to this the advertisement expenditure will have to be incurred as under:

Year	1	2	3-5	6-8
Expenditure in Rs. lakhs each year	30	15	10	4

Capital Budgeting 4.13

The company is subjected to 50% tax, straight-line method of depreciation, (permissible for tax purposes also) and taking 12% as appropriate after tax cost of Capital, should the project be accepted?
(Final-May 2002) (14 marks)

Answer

Computation of initial cash outlay

	(Rs. in lakhs)
Equipment Cost (0)	120
Working Capital (0)	<u>15</u>
	<u>135</u>

Calculation of Cash Inflows:

Years	1	2	3-5	6-8
Sales in units	80,000	1,20,000	3,00,000	2,00,000
	Rs.	Rs.	Rs.	Rs.
Contribution @ Rs. 60 p.u.	48,00,000	72,00,000	1,80,00,000	1,20,00,000
Fixed cost	16,00,000	16,00,000	16,00,000	16,00,000
Advertisement	30,00,000	15,00,000	10,00,000	4,00,000
Depreciation	<u>15,00,000</u>	<u>15,00,000</u>	<u>16,50,000</u>	<u>16,50,000</u>
Profit/(loss)	(13,00,000)	26,00,000	1,37,50,000	83,50,000
Tax @ 50%	<u>NIL</u>	<u>13,00,000</u>	<u>68,75,000</u>	<u>41,75,000</u>
Profit/(Loss) after tax	(13,00,000)	13,00,000	68,75,000	41,75,000
Add: Depreciation	<u>15,00,000</u>	<u>15,00,000</u>	<u>16,50,000</u>	<u>16,50,000</u>
Cash inflow	<u>2,00,000</u>	<u>28,00,000</u>	<u>85,25,000</u>	<u>58,25,000</u>

Computation of PV of CIF

Year	CIF Rs.	PV Factor @ 12%	Rs.
1	2,00,000	.893	1,78,600
2	28,00,000	.797	22,31,600
3	85,25,000	.712	60,69,800
4	85,25,000	.636	54,21,900
5	85,25,000	.567	48,33,675
6	58,25,000	.507	29,53,275
7	58,25,000	.452	26,32,900
8	58,25,000	.404	29,99,700
WC	15,00,000		
SV	1,00,000		
			<u>2,73,21,450</u>

4.14 Financial Management

	PV of COF 0	1,35,00,000	
Additional Investment	= Rs. 10,00,000 × .797	<u>7,97,000</u>	<u>1,42,97,000</u>
		NPV	<u>1,30,24,450</u>

Recommendation: Accept the project in view of positive NPV.

Question 7

A company proposes to install a machine involving a Capital Cost of Rs.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 Rs.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 calculate the internal rate of return of the proposal.

(PE-II-Nov. 2002) (4 marks)

Answer

Computation of cash inflow per annum	Rs.
Net operating income per annum	68,000
Less: Tax @ 45%	<u>30,600</u>
Profit after tax	37,400
Add: Depreciation (Rs.3,60,000 / 5 years)	<u>72,000</u>
Cash inflow	<u>1,09,400</u>

The IRR of the investment can be found as follows:

$$NPV = -Rs.3,60,000 + Rs.1,09,400 (PVA_{F_5, r}) = 0$$

$$\text{or } PVA_{F_5, r} (\text{Cumulative factor}) = \frac{Rs.3,60,000}{Rs.1,09,400} = 3.29$$

Computation of internal rate of return

Discounting rate	15%	16%
Cumulative factor	3.35	3.27
Total NPV(Rs.)	3,66,490	3,57,738
	(Rs.1,09,400 × 3.35)	(Rs.1,09,400 × 3.27)
Internal outlay (Rs.)	3,60,000	3,60,000
Surplus (Deficit) (Rs.)	6,490	(2262)

$$\begin{aligned} \text{IRR} &= 15 + \left[\frac{6,490}{6,490 + 2,262} \right] = 15 + 0.74 \\ &= 15.74\% \end{aligned}$$

Question 8

A company has to make a choice between two projects namely A and B. The initial capital outlay of two Projects are Rs.1,35,000 and Rs.2,40,000 respectively for A and B. There will be no scrap value at the end of the life of both the projects. The opportunity Cost of Capital of the company is 16%. The annual incomes are as under:

Year	<u>Project A</u>	Project B	Discounting factor @ 16%
1	—	60,000	0.862
2	30,000	84,000	0.743
3	1,32,000	96,000	0.641
4	84,000	1,02,000	0.552
5	84,000	90,000	0.476

You are required to calculate for each project:

- Discounted payback period
- Profitability index
- Net present value

(PE-II-Nov. 2002) (6 marks)

Answer

(1) Computation of Net Present Values of Projects

Year	<u>Cash flows</u>		Discounting factor @ 16 %	<u>Discounted Cash flow</u>	
	<u>Project A</u>	<u>Project B</u>		<u>Project A</u>	<u>Project B</u>
	Rs.	Rs.		Rs.	Rs.
	(1)	(2)	(3)	(3) × (1)	(3) × (2)
0	1,35,000	2,40,000	1.000	1,35,000	2,40,000
1	—	60,000	0.862	—	51,720
2	30,000	84,000	0.743	22,290	62,412
3	1,32,000	96,000	0.641	84,612	61,536
4	84,000	1,02,000	0.552	46,368	56,304
5.	84,000	90,000	0.476	39,984	42,840
Net present value				58,254	34,812

4.16 Financial Management

(2) Computation of Cumulative Present Values of Projects Cash inflows

Year	Project A		Project B	
	PV of cash inflows	Cumulative PV	PV of cash inflows	Cumulative PV
	Rs.	Rs.	Rs.	Rs.
1	—	—	51,720	51,720
2	22,290	22,290	62,412	1,14,132
3	84,612	1,06,902	61,536	1,75,668
4	46,368	1,53,270	56,304	2,31,972
5	39,984	1,93,254	42,840	2,74,812

(i) Discounted payback period: (Refer to Working note 2)

Cost of Project A = Rs.1,35,000

Cost of Project B = Rs.2,40,000

Cumulative PV of cash inflows of Project A after 4 years = Rs.1,53,270

Cumulative PV of cash inflows of Project B after 5 years = Rs.2,74,812

A comparison of projects cost with their cumulative PV clearly shows that the project A's cost will be recovered in less than 4 years and that of project B in less than 5 years. The exact duration of discounted pay back period can be computed as follows:

	Project A	Project B
Excess PV of cash inflows over the project cost (Rs.)	18,270 (Rs.1,53,270 – Rs.1,35,000)	34,812 (Rs.2,74,812 – Rs.2,40,000)
Computation of period required to recover excess amount of cumulative PV over project cost	0.39 year (Rs.18,270 / Rs.46,368)	0.81 years (Rs.34,812 / Rs.42,840)
(Refer to Working note 2)		
Discounted payback period	3.61 year (4 – 0.39) years	4.19 years (5 – 0.81) years

(ii) Profitability Index: $$= \frac{\text{Sum of discount cash inflows}}{\text{Initian cash outlay}}$$

$$\begin{aligned} \text{Profitability Index} &= \frac{\text{Rs.1,93,254}}{\text{Rs.1,35,000}} = 1.43 \\ \text{(for Project A)} & \end{aligned}$$

$$\begin{aligned} \text{Profitability Index} &= \frac{\text{Rs.2,74,812}}{\text{Rs.2,40,000}} = 1.15 \\ (\text{for Project B}) \end{aligned}$$

$$(iii) \text{ Net present value} = \text{Rs.58,254}$$

(for Project A)

(Refer to Working note 1)

$$\text{Net present value} = \text{Rs.34,812}$$

(for Project B)

Question 9

The cash flows of projects C and D are reproduced below:

Project	Cash Flow				NPV	
	C ₀	C ₁	C ₂	C ₃	at 10%	IRR
C	– Rs.10,000	+ 2,000	+ 4,000	+ 12,000	+ Rs.4,139	26.5%
D	– Rs.10,000	+ 10,000	+ 3,000	+ 3,000	+ Rs.3,823	37.6%

(i) Why there is a conflict of rankings?

(ii) Why should you recommend project C in spite of lower internal rate of return?

Time	1	2	3
Period			
$PVIF_{0.10, t}$	0.9090	0.8264	0.7513
$PVIF_{0.14, t}$	0.8772	0.7695	0.6750
$PVIF_{0.15, t}$	0.8696	0.7561	0.6575
$PVIF_{0.30, t}$	0.7692	0.5917	0.4552
$PVIF_{0.40, t}$	0.7143	0.5102	0.3644

(PE-II-May. 2003) (8 marks)

Answer

(i) Net Present Value at different discounting rates

Project	0%	10%	15%	30%	40%
	Rs.	Rs.	Rs.	Rs.	Rs.
C	8,000	4,139	2,654	–632	–2,158
	{Rs.2,000	{Rs.2,000 × 0.909	{Rs.2,000 × 0.8696	{Rs.2,000 × 0.7692	{Rs.2,000 × 0.7143
	+Rs.4,000	+Rs.4,000 × 0.8264	+ Rs.4,000 × 0.7561	+ Rs.4,000 × 0.5917	+ Rs.4,000 × 0.5102
	+Rs.12,000	+Rs.12,000 ×	+ Rs.12,000 × 0.6575	+Rs.12,000 × 0.4552	+ Rs.12,000 × 0.3644

4.18 Financial Management

		0.7513			
	–Rs.10,000}	–Rs.10,000}	– Rs.10,000}	– Rs.10,000}	– Rs.10,000}
Ranking	I	I	II	II	II
D	6,000	3,823	2,937	833	– 233
	{Rs.10,000	{Rs.10,000 × 0.909	{Rs.10,000 × 0.8696	{Rs.10,000 × 0.7692	{Rs.10,000 × 0.7143
	+Rs.3,000	+Rs.3,000 × 0.8264	+Rs.3,000 × 0.7561	+ Rs.3,000 × 0.5917	+Rs.3,000 × 0.5102
	+Rs.3,000	+Rs.3,000 × 0.7513	+Rs.3,000 × 0.6575	+ Rs.3,000 × 0.4552	+Rs.3,000 × 0.3644
	–Rs.10,000}	– Rs.10,000}	– Rs.10,000}	– Rs.10,000}	– Rs.10,000}
Ranking	II	II	I	I	I

The conflict in ranking arises because of skewness in cash flows. In the case of Project C cash flows occur more later in the life and in the case of Project D, cash flows are skewed towards the beginning.

At lower discount rate, project C's NPV will be higher than that of project D. As the discount rate increases, Project C's NPV will fall at a faster rate, due to compounding effect.

After break even discount rate, Project D has higher NPV as well as higher IRR.

- (ii) If the opportunity cost of funds is 10%, project C should be accepted because the firm's wealth will increase by Rs.316 (Rs.4,139 – Rs.3,823)

The following statement of incremental analysis will substantiate the above point.

Project	Cash Flows (Rs.)				NPV at	IRR
	C_0	C_1	C_2	C_3	10%	12.5%
	Rs.	Rs.		Rs.	Rs.	
C–D	0	–8,000	1,000	9,000	316	0
					{–8,000 × 0.909	{–8,000 × 0.88884
					+1,000 × 0.8264	+ 1,000 × 0.7898
					+ 9,000 × 0.7513}	+ 9,000 × 0.7019}

Hence, the project C should be accepted, when opportunity cost of funds is 10%.

Question 10

Beta Company Limited is considering replacement of its existing machine by a new machine, which is expected to cost Rs.2,64,000. The new machine will have a life of five years and will yield annual cash revenues of Rs.5,68,750 and incur annual cash expenses of Rs.2,95,750. The estimated salvage value of the new machine is Rs.18,200. The existing machine has a book value of Rs.91,000 and can be sold for Rs.45,500 today.

The existing machine has a remaining useful life of five years. The cash revenues will be Rs.4,55,000 and associated cash expenses will be Rs.3,18,500. The existing machine will have a salvage value of Rs.4,550, at the end of five years.

The Beta Company is in 35% tax- bracket, and write off depreciation at 25% on written-down value method.

The Beta Company has a target debt to value ratio of 15%. The Company in the past has raised debt at 11% and it can raise fresh debt at 10.5%.

Beta Company plans to follow dividend discount model to estimate the cost of equity capital. The Company plans to pay a dividend of Rs.2 per share in the next year. The current market price of Company's equity share is Rs.20 per equity share. The dividend per equity share of the Company is expected to grow at 8% p.a.

Required:

- (i) Compute the incremental cash flows of the replacement decision.
- (ii) Compute the weighted average cost of Capital of the Company.
- (iii) Find out the net present value of the replacement decision.
- (iv) Estimate the discounted payback period of the replacement decision.
- (v) Should the Company replace the existing machine ? Advise.

(PE-II-Nov. 2003) (12 marks)

Answer

(i) Incremental Cash Flows Statements of the replacement decision

Description	0	1	2	3	4	5
	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
(a) Incremental sales (cash)	—	1,13,750	1,13,750	1,13,750	1,13,750	1,13,750
(b) Incremental cash	—					
Operating cost		(22,750)	(22,750)	(22,750)	(22,750)	(22,750)
Depreciation						
— New machine		66,000	49,500	37,125	27,844	20,883
— Old machine		<u>22,750</u>	<u>17,063</u>	<u>12,797</u>	<u>9,598</u>	<u>7,198</u>
(c) Incremental depreciation		43,250	32,437	24,328	18,246	13,685
(d) EBIT (a—b—c)		93,250	1,04,063	1,12,172	1,18,254	1,22,815
(e) Tax 35% of (d)		32,638	36,422	39,260	41,389	42,985
(f) NOPAT : (d—e)		60,612	67,641	72,912	76,865	79,830
(g) Free operating cash in flows: (f+c)		1,03,862	1,00,078	97,240	95,111	93,515
(h) Capital expenditure	(2,18,500)	—	—	—	—	—

4.20 Financial Management

(i)	Incremental salvage value (Rs. 18,200 – Rs. 4,550)						13,650
(j)	Tax saving incremental (On loss of sale of machines (Rs. 44,448 – Rs. 17,045) × .35%)						9,591
	Incremental cash flows of the replacement decision	<u>(2,18,500)</u>	<u>1,03,862</u>	<u>1,00,078</u>	<u>97,240</u>	<u>95,111</u>	<u>1,16,756</u>

(ii) Computation of weighted average cost of capital of the company (WACC):

$$\begin{aligned}
 K_e &= \frac{D_1}{P_0} + g \\
 &= \frac{\text{Rs. } 2}{\text{Rs. } 20} + 8\% = 18\% \\
 K_d &= 10.5\% \times (1 - 0.35) = 6.825\% \\
 \text{WACC} &= K_d \times \frac{D}{D+E} + K_e \times \frac{E}{D+E} \\
 &= 6.825\% \times 15\% + 18\% \times 85\% \\
 &= 16.32\% \text{ or } 16.32375\%
 \end{aligned}$$

(iii) Computation of net present value of the replacement decision:

$$\begin{aligned}
 \text{NPV} &= \sum_{t=1}^5 \frac{\text{FCFF}_t}{(1 + 0.1632375)^t} - \text{OI} \\
 &= (2,18,500) + 89,287 + 73,961 + 61,779 + 51,948 + 54,820 \\
 &= \text{Rs. } 1,13,295
 \end{aligned}$$

(iv) Discounted payback period of the replacement decision:

$$= 2 \text{ years } 10 \text{ months } 22 \text{ days approx.}$$

(v) Advise: The company should replace the existing machine with new machine.

Question 11

The cash flows of two mutually exclusive Projects are as under:

	t_0	t_1	t_2	t_3	t_4	t_5	t_6
Project 'P' (Rs.)	(40,000)	13,000	8,000	14,000	12,000	11,000	15,000
Project 'J' (Rs.)	(20,000)	7,000	13,000	12,000	—	—	—

Required:

- Estimate the net present value (NPV) of the Project 'P' and 'J' using 15% as the hurdle rate.
- Estimate the internal rate of return (IRR) of the Project 'P' and 'J'.

- (iii) Why there is a conflict in the project choice by using NPV and IRR criterion?
 (iv) Which criteria you will use in such a situation? Estimate the value at that criterion. Make a project choice.

The present value interest factor values at different rates of discount are as under:

Rate of discount	t_0	t_1	t_2	t_3	t_4	t_5	t_6
0.15	1.00	0.8696	0.7561	0.6575	0.5718	0.4972	0.4323
0.18	1.00	0.8475	0.7182	0.6086	0.5158	0.4371	0.3704
0.20	1.00	0.8333	0.6944	0.5787	0.4823	0.4019	0.3349
0.24	1.00	0.8065	0.6504	0.5245	0.4230	0.3411	0.2751
0.26	1.00	0.7937	0.6299	0.4999	0.3968	0.3149	0.2499

(PE-II-May. 2004) (7 marks)

Answer

- (i) **Estimation of net present value (NPV) of the Project 'P' and 'J' using 15% as the hurdle rate:**

NPV of Project 'P' :

$$\begin{aligned}
 &= -40,000 + \frac{13,000}{(1.15)^1} + \frac{8,000}{(1.15)^2} + \frac{14,000}{(1.15)^3} + \frac{12,000}{(1.15)^4} + \frac{11,000}{(1.15)^5} + \frac{15,000}{(1.15)^6} \\
 &= -40,000 + 11,304.35 + 6,049.15 + 9,205.68 + 6,861.45 + 5,469.37 + 6,485.65 \\
 &= \text{Rs. } 5,375.65 \quad \text{or} \quad \text{Rs. } 5,376
 \end{aligned}$$

NPV of Project 'J' :

$$\begin{aligned}
 &= -20,000 + \frac{7,000}{(1.15)^1} + \frac{13,000}{(1.15)^2} + \frac{12,000}{(1.15)^3} \\
 &= -20,000 + 6,086.96 + 9,829.87 + 7,890.58 \\
 &= \text{Rs. } 3,807.41
 \end{aligned}$$

- (ii) **Estimation of internal rate of return (IRR) of the Project 'P' and 'J'**

Internal rate of return r (IRR) is that rate at which the sum of cash inflows after discounting equals to the discounted cash out flows. The value of r in the case of given projects can be determined by using the following formula:

$$CO_0 = \frac{CF_0}{(1+r)^0} + \frac{CF_1}{(1+r)^1} + \dots + \frac{CF_n}{(1+r)^n} + \frac{SV + WC}{(1+r)^n}$$

Where CO_0 = Cash flows at the time 0

CF_t = Cash inflow at the end of year t

r = Discount rate

4.22 Financial Management

n = Life of the project

SV & WC = Salvage value and working capital at the end of n years.

In the case of project 'P' the value of r (IRR) is given by the following relation:

$$40,000 = \frac{13,000}{(1+r\%)^1} + \frac{8,000}{(1+r\%)^2} + \frac{14,000}{(1+r\%)^3} + \frac{12,000}{(1+r\%)^4} + \frac{11,000}{(1+r\%)^5} + \frac{15,000}{(1+r\%)^6}$$
$$r = 19.73\%$$

Similarly we can determine the internal rate of return for the project 'J'. In the case of project 'J' it comes to:

$$r = 25.20\%$$

- (iii) The conflict between NPV and IRR rule in the case of mutually exclusive project situation arises due to re-investment rate assumption. NPV rule assumes that intermediate cash flows are reinvested at k and IRR assumes that they are reinvested at r . The assumption of NPV rule is more realistic.
- (iv) When there is a conflict in the project choice by using NPV and IRR criterion, we would prefer to use "Equal Annualized Criterion". According to this criterion the net annual cash inflow in the case of Projects 'P' and 'J' respectively would be:

$$\begin{aligned}\text{Project 'P'} &= (\text{Net present value/ cumulative present value of Re.1 p.a} \\ &\quad \text{@15\% for 6 years}) \\ &= (\text{Rs.5,375.65 / 3.7845}) \\ &= \text{Rs.1,420.44} \\ \text{Project 'J'} &= (\text{Rs.3807.41/2.2832}) \\ &= \text{Rs.1667.58}\end{aligned}$$

Since the cash inflow per annum in the case of project 'J' is more than that of project 'P', so Project J is recommended.

Question 12

- (a) PQR Limited has decided to go in for a new model of Mercedes Car. The cost of the vehicle is Rs.40 lakhs. The company has two alternatives:

- (i) taking the car on finance lease; or
(ii) borrowing and purchasing the car.

LMN Limited is willing to provide the car on finance lease of PQR Limited for five years at an annual rental of Rs.8.75 lakhs, payable at the end of the year.

The vehicle is expected to have useful life of 5 years, and it will fetch a net salvage value of Rs.10 lakhs at the end of year five. The depreciation rate for tax purpose is 40% on written-down value basis. The applicable tax rate for the company is 35%. The applicable before tax borrowing rate for the company is 13.8462%.

What is the net advantage of leasing for the PQR Limited?

The values of present value interest factor at different rates of discount are as under:

Rate of discount	t_1	t_2	t_3	t_4	t_5
0.138462	0.8784	0.7715	0.6777	0.5953	0.5229
0.09	0.9174	0.8417	0.7722	0.7084	0.6499

(PE-II-May. 2004) (8 marks)

Answer

Cash flow of lease contract is shown below:

(Rs. in lakhs)

	0	1	2	3	4	5
Cost of car	40					
Depreciation		16	9.6	5.76	3.456	2.0736
Loss of depreciation tax shield (Dep $\times$ tax rate)		-5.6	-3.36	-2.016	-1.2096	-0.7258
Lease payment		-8.75	-8.75	-8.75	-8.75	-8.75
Tax shield on lease payment		3.0625	3.0625	3.0625	3.0625	3.0625
Loss of salvage value						-10
Cash flow of lease	40	-11.2875	-9.0475	-7.7035	-6.8971	-16.4133

Present value cash flow of lease = Rs.39.47 lakhs	-10.3551	-7.61528	-5.9486	-4.8859	-10.667
	(-11.2875 $\times$ 0.9174)	(-9.0475 $\times$ 0.8417)	(-7.7035 $\times$ 0.7722)	(-6.8971 $\times$ 0.7084)	(-16.4133 $\times$ 0.6499)

Net Advantage of Leasing ($K_d = 9\%$) = Rs.0.53 lakhs (Rs.40 lakhs – Rs.39.47 lakhs)

Question 13

PQR Ltd. is evaluating a proposal to acquire new equipment. The new equipment would cost Rs. 3.5 million and was expected to generate cash inflows of Rs. 4,70,000 a year for nine years. After that point, the equipment would be obsolete and have no significant salvage value. The company's weighted average cost of capital is 16%.

4.24 Financial Management

The management of the PQR Ltd. seemed to be convinced with the merits of the investment but was not sure about the best way to finance it. PQR Ltd. could raise the money by issuing a secured eight-year note at an interest rate of 12%. However, PQR Ltd. had huge tax-loss carry forwards from a disastrous foray into foreign exchange options. As a result, the company was unlikely to be in a position of tax-paying for many years. The CEO of PQR Ltd. thought it better to lease the equipment than to buy it. The proposals for lease have been obtained from MGM Leasing Ltd. and Zeta Leasing Ltd. The terms of the lease are as under:

	MGM Leasing Ltd.	Zeta Leasing Ltd.
Lease period offered	9 years	7 years
Number of lease rental payments with initial lease payment due on entering the lease contract	10	8
Annual lease rental	Rs. 5,44,300	Rs. 6,19,400
Lease terms equivalent to borrowing cost (Claim of lessor)	11.5% p.a.	11.41% p.a.
Leasing terms proposal coverage	Entire Rs. 3.5 million cost of equipment	Entire Rs. 3.5 million cost of equipment
Tax rate	35%	35%

Both the Leasing companies were in a tax-paying position and write off their investment in new equipment using following rate:

Year	1	2	3	4	5	6
Depreciation rate	20%	32%	19.20%	11.52%	11.52%	5.76%

Required:

- Calculate the NPV to PQR Ltd. of the two lease proposals.
- Does the new equipment have a positive NPV with (i) ordinary financing, (ii) lease financing ?
- Calculate the NPVs of the leases from the lessors' view points. Is there a chance that they could offer more attractive terms ?
- Evaluate the terms presented by each of the lessors. (PE-II-Nov. 2004) (16 marks)

Answer

(i) NPV to PQR Ltd of MGM Leasing Ltd lease proposal.

Investment decision: Present value of Operating cash inflows

Present Value at 16% = Rs 4,70,000 × 4.6065 = Rs 21,65,055 (A)

Financing decision : Present value of cash outflows

$$\begin{aligned}\text{Present value at 12 \%} &= \text{Rs } 5,44,300 + \text{Rs } 5,44,300 \times 5.3282 \\ &= \text{Rs } 34,44,439 \quad (B)\end{aligned}$$

$$\text{Hence Net Present Value} = (A) - (B) = (\text{Rs } 12,79,384)$$

NPV to PQR Ltd of Zeta Leasing Ltd lease proposal.

Investment decision :Present value of Operating cash inflows

$$\text{Present Value at 16\%} = \text{Rs } 4,70,000 \times 4.6065 = \text{Rs } 21,65,055 \quad (A)$$

Financing decision : Present value of cash outflows

$$\begin{aligned}\text{Present value at 12 \%} &= \text{Rs } 6,19,400 + \text{Rs } 6,19,400 \times 4.5638 \\ &= \text{Rs } 34,46,218. \quad (B)\end{aligned}$$

$$\text{Hence Net Present Value} = (A) - (B) = (\text{Rs } 12,81,163)$$

(ii) NPV of new equipment with ordinary financing

Investment decision :Present value of Operating cash inflows

$$\text{Present Value at 16\%} = \text{Rs } 4,70,000 \times 4.6065 = \text{Rs } 21,65,055 \quad (A)$$

Financing decision : Present value of cash outflows

$$\text{Rs } 35,00,000 \quad (B)$$

$$\text{Hence Net Present Value} = (A) - (B) = (\text{Rs } 13,34,945)$$

Conclusion : The company has a negative NPV with ordinary financing as well as lease financing.

(iii) NPV to MGM Leasing Ltd.

(Rs, 000)							
Year	Equipm ent cost	Dep'n	Dep'n tax shield	After tax lease payment	After tax CFs	Presen t value factor at 7.8%	After tax CFs(Prese nt Value)
0	(3,500)	700	245	353.795	(2,901.21)	1	(2,901.21)
1		1,120	392	353.795	745.795	0.928	692.0978
2		672	235.2	353.795	588.995	0.861	507.1247
3		403.2	141.12	353.795	494.915	0.798	394.9422
4		403.2	141.12	353.795	494.915	0.74	366.2371
5		201.6	70.56	353.795	424.355	0.687	291.5319
6				353.795	353.795	0.637	225.3674
7				353.795	353.795	0.591	209.0928
8				353.795	353.795	0.548	193.8797
9				353.795	353.795	0.509	180.0817
Total						7.299	159.1502

4.26 Financial Management

Discount rate = $12\% \times (1 - 0.35) = 7.8\%$

NPV = Rs 159.1502

MGM Lease Ltd's NPV is positive. They could reduce the lease terms by Rs 1,59,150 divided by cumulative PV factor at 7.8% (7.299) divided by $(1 - 0.35)$ i.e. Rs 33,545.16 to make their proposal more attractive.

NPV to Zeta Leasing Ltd.

							(Rs 000)
Year	Equip- ment cost	Dep'n	Dep'n tax shield	After tax lease payment	After tax CFs	Present value factor at 7.8%	After tax CFs (Present Value)
0	(3,500)	700	245	402.61	(2,852.39)	1	(2852.39)
1		1,120	392	402.61	794.61	0.928	737.3981
2		672	235.2	402.61	637.81	0.861	549.1544
3		403.2	141.12	402.61	543.73	0.798	433.8965
4		403.2	141.12	402.61	543.73	0.74	402.3602
5		201.6	70.56	402.61	473.17	0.687	325.0678
6				402.61	402.61	0.637	256.4626
7				402.61	402.61	0.591	237.9425
						6.242	89.8921

NPV (7.8%) = Rs. Rs 89,892

Zeta Ltd could improve the proposal by reducing the lease terms by Rs 89,892 divided by cumulative PV factor at 7.8% (6.242) divided by $(1 - 0.35)$ i.e. Rs 22,155.62 to make their proposal more attractive.

- (iv) From PQR Ltd's point of view the leasing terms offered by MGM Leasing gives the least Net Present Value. PQR Ltd is not getting tax shield on leasing, depreciation and interest because of heavy losses incurred in the earlier years. With proper negotiations, the leasing terms can be reduced marginally.

Question 14

MNP Limited is thinking of replacing its existing machine by a new machine which would cost Rs. 60 lakhs. The company's current production is Rs. 80,000 units, and is expected to increase to 1,00,000 units, if the new machine is bought. The selling price of the product would remain unchanged at Rs. 200 per unit. The following is the cost of producing one unit of product using both the existing and new machine:

Capital Budgeting 4.27

		Existing Machine (80,000 units)	New Machine (1,00,000 units)	Unit cost (Rs.) Difference
Materials		75.0	63.75	(11.25)
Wages & Salaries		51.25	37.50	(13.75)
Supervision		20.0	25.0	5.0
Repairs and Maintenance		11.25	7.50	(3.75)
Power and Fuel		15.50	14.25	(1.25)
Depreciation		0.25	5.0	4.75
Allocated Corporate Overheads		10.0	12.50	2.50
		183.25	165.50	(17.75)

The existing machine has an accounting book value of Rs. 1,00,000, and it has been fully depreciated for tax purpose. It is estimated that machine will be useful for 5 years. The supplier of the new machine has offered to accept the old machine for Rs. 2,50,000. However, the market price of old machine today is Rs. 1,50,000 and it is expected to be Rs. 35,000 after 5 years. The new machine has a life of 5 years and a salvage value of Rs., 2,50,000 at the end of its economic life. Assume corporate Income tax rate at 40%, and depreciation is charged on straight line basis for Income-tax purposes. Further assume that book profit is treated as ordinary income for tax purpose. The opportunity cost of capital of the Company is 15%.

Required:

- (i) Estimate net present value of the replacement decision.
- (ii) Estimate the internal rate of return of the replacement decision.
- (iii) Should Company go ahead with the replacement decision? Suggest.

Year (t)	1	2	3	4	5
$PVIF_{0.15,t}$	0.8696	0.7561	0.6575	0.5718	0.4972
$PVIF_{0.20,t}$	0.8333	0.6944	0.5787	0.4823	0.4019
$PVIF_{0.25,t}$	0.80	0.64	0.512	0.4096	0.3277
$PVIF_{0.30,t}$	0.7692	0.5917	0.4552	0.3501	0.2693
$PVIF_{0.35,t}$	0.7407	0.5487	0.4064	0.3011	0.2230

(PE-II-Nov. 2005) (8+3+1=12marks)

4.28 Financial Management

Answer

(i) Net Cash Outlay of New Machine

Purchase Price	Rs. 60,00,000
Less: Exchange value of old machine	
[2, 50,000- 0.4(2,50,000-0)]	<u>1,50,000</u>
	<u>Rs. 58,50,000</u>

Market Value of Old Machine: The old machine could be sold for Rs. 1,50,000 in the market. Since the exchange value is more than the market value, this option is not attractive. This opportunity will be lost whether the old machine is retained or replaced. Thus, on incremental basis, it has no impact.

Depreciation base: Old machine has been fully depreciated for tax purpose.

Thus the depreciation base of the new machine will be its original cost i.e. Rs. 60,00,000.

Net Cash Flows: Unit cost includes depreciation and allocated overheads. Allocated overheads are allocations from corporate office therefore they are irrelevant. The depreciation tax shield may be computed separately. Excluding depreciation and allocated overheads, unit costs can be calculated. The company will obtain additional revenue from additional 20,000 units sold.

Thus, after-tax saving, excluding depreciation, tax shield, would be

$$\begin{aligned}
 &= \{100,000(200 - 148) - 80,000(200 - 173)\} \times (1 - 0.40) \\
 &= \{52,00,000 - 21,60,000\} \times 0.60 \\
 &= \text{Rs. } 18,24,000
 \end{aligned}$$

After adjusting depreciation tax shield and salvage value, net cash flows and net present value is estimated.

Calculation of Cash flows and Project Profitability

		0	1	2	3	4	5
							Rs. ('000)
1	After-tax savings	-	1824	1824	1824	1824	1824
2	Depreciation (Rs. 60,00,000 - 2,50,000)/5	-	1150	1150	1150	1150	1150
3	Tax shield on depreciation (Depreciation × Tax rate)	-	460	460	460	460	460
4	Net cash flows from operations (1+3)	-	2284	2284	2284	2284	2284

Capital Budgeting 4.29

5	Initial cost	(5850)					
6	Net Salvage Value (2,50,000 – 35,000)	-	-	-	-	-	215
7	Net Cash Flows (4+5+6)	(5850)	2284	2284	2284	2284	2499
8	PVF at 15%	1.00	0.8696	0.7561	0.6575	0.5718	0.4972
9	PV	(5850)	1986.166	1726.932	1501.73	1305.99	1242.50
10	NPV	Rs. 1913.32					

(ii)

						Rs. (‘000)
	0	1	2	3	4	5
NCF	(5850)	2284	2284	2284	2284	2499
PVF at 20%	1.00	0.8333	0.6944	0.5787	0.4823	0.4019
PV	(5850)	1903.257	1586.01	1321.751	1101.57	1004.35
PV of benefits	6916.94					
PVF at 30%	1.00	0.7692	0.5917	0.4550	0.3501	0.2693
PV	(5850)	1756.85	1351.44	1039.22	799.63	672.98
PV of benefits	5620.12					

$$\begin{aligned} \text{IRR} &= 20\% + 10\% \times \frac{1066.94}{1296.82} \\ &= 28.23\% \end{aligned}$$

(iii) **Advise:** The company should go ahead with replacement project, since it is positive NPV decision.

Question 15

A Company is considering a proposal of installing a drying equipment. The equipment would involve a Cash outlay of Rs. 6,00,000 and net Working Capital of Rs. 80,000. The expected life of the project is 5 years without any salvage value. Assume that the company is allowed to charge depreciation on straight-line basis for Income-tax purpose. The estimated before-tax cash inflows are given below:

4.30 Financial Management

Year	Before-tax Cash inflows (Rs. '000)				
	1	2	3	4	5
	240	275	210	180	160

The applicable Income-tax rate to the Company is 35%. If the Company's opportunity Cost of Capital is 12%, calculate the equipment's discounted payback period, payback period, net present value and internal rate of return.

The PV factors at 12%, 14% and 15% are:

Year	1	2	3	4	5
PV factor at 12%	0.8929	0.7972	0.7118	0.6355	0.5674
PV factor at 14%	0.8772	0.7695	0.6750	0.5921	0.5194
PV factor at 15%	0.8696	0.7561	0.6575	0.5718	0.4972

(PE-II-May 2006) (10 marks)

Answer

- (i) Equipment's initial cost = Rs. 6,00,000 + 80,000 = Rs. 6,80,000
- (ii) Annual straight line depreciation = Rs. 6,00,000/5 = Rs. 1,20,000.
- (iii) Net cash flows can be calculated as follows:

$$= \text{Before tax CFs} \times (1 - T_c) + T_c \times \text{Depreciation}$$

(Rs. '000)						
CFs						
Year	0	1	2	3	4	5
1. Initial cost	(680)					
2. Before tax CFs		240	275	210	180	160
3. Tax @ 35%		<u>84</u>	<u>96.25</u>	<u>73.5</u>	<u>63</u>	<u>56</u>
4. After tax-CFs		156	178.75	136.5	117	104
5. Depreciation tax shield (Depreciation $\times$ T_c)		42	42	42	42	42
6. Working capital released		<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>	<u>80</u>
7. Net Cash Flow (4 + 5 + 6)		198	220.75	178.5	159	226
8. PVF at 12%	1.00	0.8929	0.7972	0.7118	0.6355	0.5674
9. PV (7 $\times$ 8)	(680)	176.79	175.98	127.06	101.04	128.24
10. NPV	29.12					

	0	1	2	3	4	5
PVF at 15%	1	0.8696	0.7561	0.6575	0.5718	0.4972
PV	(680)	172.18	166.91	117.36	90.92	112.37
NPV	-20.26					

Internal Rate of Return

$$\begin{aligned} \text{IRR} &= 12\% + \frac{29.12}{49.38} \times 3\% \\ &= 13.77\% \end{aligned}$$

Discounted Payback Period

$$\begin{aligned} \text{Discounted CFs at } K = 12\% \text{ considered} &= 176.79 + 175.98 + 127.06 + 101.04 + 12 \times \frac{99.13}{128.24} \\ &= 4 \text{ years and } 9.28 \text{ months} \end{aligned}$$

Payback Period (NCFs are considered)

$$\begin{aligned} &= 198 + 220.75 + 178.5 + 12 \times \frac{82.75}{159} \\ &= 3 \text{ years and } 6.25 \text{ months} \end{aligned}$$

Question 16

Company UVW has to make a choice between two identical machines, in terms of Capacity, 'A' and 'B'. They have been designed differently, but do exactly the same job.

Machine 'A' costs Rs. 7,50,000 and will last for three years. It costs Rs. 2,00,000 per year to run.

Machine 'B' is an economy model costing only Rs. 5,00,000, but will last for only two years. It costs Rs. 3,00,000 per year to run.

The cash flows of Machine 'A' and 'B' are real cash flows. The costs are forecasted in rupees of constant purchasing power. Ignore taxes. The opportunity cost of capital is 9%.

Required:

Which machine the company UVW should buy?

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

Year	t_1	t_2	t_3
$PVIF_{0.09,t}$	0.9174	0.8417	0.7722

(PE-II-Nov. 2006) (8 marks)

4.32 Financial Management

Answer

Statement Showing the Evaluation of Two Machines

Machines	A	B
(i) Purchase Cost	Rs. 7,50,000	Rs. 5,00,000
(ii) Life of Machine	3 years	2 years
(iii) Running Cost of Machine per year	Rs. 2,00,000	Rs. 3,00,000
(iv) PVIFA 0.09,3	2.5313	
PVIFA 0.09, 2		1.7591
(v) PV of Running Cost of Machine	Rs. 5,06,260	Rs. 5,27,730
(vi) Cash outflows of Machine {(i) + (v)}	Rs. 12,56,260	Rs. 10,27,730
(vii) Equivalent PV of Annual Cash outflow (vi/iv)	Rs. 4,96,290	Rs. 5,84,236

Recommendation: Company UVW should buy Machine 'A' since equivalent annual cash outflow is less than that of Machine B.

Question 17

A company is considering the proposal of taking up a new project which requires an investment of Rs. 400 lakh on machinery and other assets. The project is expected to yield the following earnings (before depreciation and taxes) over the next five years:

Year	Earnings (Rs. in lakh)
1	160
2	160
3	180
4	180
5	150

The cost of raising the additional capital is 12% and assets have to be depreciated at 20% on 'Written Down Value' basis. The scrap value at the end of the five years' period may be taken as zero. Income-tax applicable to the company is 50%.

You are required to calculate the net present value of the project and advise the management to take appropriate decision. Also calculate the Internal Rate of Return of the Project.

Note: Present value of Re. 1 at different rates of interest are as follows:

Year	10%	12%	14%	16%
1	0.91	0.89	0.88	0.86
2	0.83	0.80	0.77	0.74

3	0.75	0.71	0.67	0.64
4	0.68	0.64	0.59	0.55
5	0.62	0.57	0.52	0.48

(PE-II-May 2007) (8 marks)

Answer

(a) (i) Calculation of Net Cash Flow

(Rs. in lakhs)

Year	Profit before dep. and tax	Depreciation (20% on WDV)	PBT	PAT	Net cash flow
(1)	(2)	(3)	(4)	(5)	(3) + (5)
1	160	$400 \times 20\% = 80$	80	40	120
2	160	$(400 - 80) \times 20\% = 64$	96	48	112
3	180	$(320 - 64) \times 20\% = 51.2$	128.8	64.4	115.6
4	180	$(256 - 51.2) \times 20\% = 40.96$	139.04	69.52	110.48
5	150	$(204.8 - 40.96) = 163.84^*$	-13.84	-6.92	156.92

*including depreciation and loss on disposal of assets.

(ii) Calculation of Net Present Value (NPV)

(Rs. in lakhs)

Year	Net Cash Flow	12%		14%		16%	
		D.F	P.V	D.F	P.V	D.F	P.V
1	120	.89	106.8	.88	105.60	.86	103.2
2	112	.80	89.6	.77	86.24	.74	82.88
3	115.6	.71	82.08	.67	77.45	.64	73.98
4	110.48	.64	70.70	.59	65.18	.55	60.76
5	156.92	.57	<u>89.44</u>	.52	<u>81.60</u>	.48	<u>75.32</u>
			438.62		416.07		396.14
	Less: Initial Investment		400.00		<u>400.00</u>		<u>400.00</u>
	NPV		<u>38.62</u>		<u>16.07</u>		<u>-3.86</u>

(iii) **Advise:** Since Net Present Value of the project at 12% = 38.62 lakhs, therefore the project should be implemented.

(iv) Calculation of Internal Rate of Return (IRR)

4.34 Financial Management

$$\begin{aligned} \text{IRR} &= 14\% + \frac{16.07 \times 2\%}{16.07 - (-3.86)} \\ &= 14\% + \frac{32.14}{19.93} \\ &= 14\% + 1.61\% = 15.61\%. \end{aligned}$$

Question 18

Consider the following mutually exclusive projects:

Projects	Cash flows (Rs.)				
	C_0	C_1	C_2	C_3	C_4
A	-10,000	6,000	2,000	2,000	12,000
B	-10,000	2,500	2,500	5,000	7,500
C	-3,500	1,500	2,500	500	5,000
D	-3,000	0	0	3,000	6,000

Required:

- Calculate the payback period for each project.
- If the standard payback period is 2 years, which project will you select? Will your answer differ, if standard payback period is 3 years?
- If the cost of capital is 10%, compute the discounted payback period for each project. Which projects will you recommend, if standard discounted payback period is (i) 2 years; (ii) 3 years?
- Compute NPV of each project. Which project will you recommend on the NPV criterion? The cost of capital is 10%. What will be the appropriate choice criteria in this case? The PV factors at 10% are:

Year	1	2	3	4
PV factor at 10%	0.9091	0.8264	0.7513	0.6830
(PV/F 0.10, t)				

(PE-II-Nov. 2007) (10 marks)

Answer

(i) Payback Period of Projects

	C_0	C_1	C_2	C_3	
A	- 10,000 +	6,000 +	2,000 +	2,000	= 3 years
B	- 10,000 +	2,500 +	2,500 +	5,000	= 3 years
C	- 3,500 +	1,500 +	2,500		= 1 year and 9.6 months

$$\text{i.e. } \frac{12}{2,500} \times 2,000$$

$$D \quad -3,000 \quad + \quad 0 \quad + \quad 0 \quad + \quad 3,000 = 3 \text{ years.}$$

- (ii) If standard payback period is 2 years, Project C is the only acceptable project. But if standard payback period is 3 years, all the four projects are acceptable.

- (iii) **Discounted Payback Period** (Cash flows discounted at 10%)

$$A \quad -10,000 + 5,454.6 + 1,652.8 + 1,502.6 + 8,196$$

$$3 \text{ years} + \frac{12}{8,196} \times 1,390 = 3 \text{ years and 2 months}$$

$$B \quad -10,000 + 2,272.75 + 2,066 + 3,756.5 + 5,122.50$$

$$3 \text{ years} + \frac{12}{5,122.55} \times 1,904.75 = 3 \text{ years and 4.6 months}$$

$$C \quad -3,500 + 1,363.65 + 2,066 + 375.65 + 3,415$$

$$2 \text{ years} + \frac{12}{375.65} \times 70.35 = 2 \text{ years and 2.25 months}$$

$$D \quad -3,000 + 0 + 0 + 2,253.9 + 4,098$$

$$3 \text{ years} + \frac{12}{4,098} \times 746.10 = 3 \text{ years and 2.18 months}$$

If standard discounted payback period is 2 years, no project is acceptable on discounted payback period criterion.

If standard discounted payback period is 3 years, Project 'C' is acceptable on discounted payback period criterion.

- (iv) **Evaluation of Projects on NPV criterion**

$$A = -10,000 + 5,454.6 + 1,652.8 + 1,502.60 + 8,196$$

$$\text{NPV} = \text{Rs. } 6,806.2$$

$$B = -10,000 + 2,272.75 + 2,066 + 3,756.5 + 5,122.5$$

$$\text{NPV} = \text{Rs. } 3,217.75$$

$$C = -3,500 + 1,363.65 + 2,066 + 375.65 + 3,415$$

$$\text{NPV} = \text{Rs. } 3,720.3$$

$$D = -3,000 + 0 + 0 + 2,253.9 + 4,098$$

$$\text{NPV} = \text{Rs. } 3,351.9$$

4.36 Financial Management

Ranking of Projects on NPV Criterion

	NPV	Rank
	Rs.	
A	6,806.2	I
B	3,217.75	IV
C	3,720.3	II
D	3,351.9	III

Analysis: Project A is acceptable under the NPV method. The NPV technique is superior to any other technique of capital budgeting, whether it is PI or IRR. The best project is the one which adds the most, among available alternatives, to the shareholders wealth. The NPV method, by its very definition, will always select such projects. Therefore, the NPV method gives a better mutually exclusive choice than PI method. The NPV method guarantees the choice of the best alternative.

Question 19

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

	Figures in Rs. '000)					
Year	0	1	2	3	4	5
Project-A	(500)	85	200	240	220	70
Project-B	(500)	480	100	70	30	20

The discount factors are as under:

Year	0	1	2	3	4	5
PVF (10%)	1	0.91	0.83	0.75	0.68	0.62
PVF (20%)	1	0.83	0.69	0.58	0.48	0.41

Required:

- Calculate the NPV and IRR of each project.
- State with reasons which project you would recommend.
- Explain the inconsistency in ranking of two projects. (PE-II-May 2008) (8 marks)

Answer

(i) Computation of NPV and IRR

For Project A:

Years	Cash flows Rs. '000	PVF _{10%}	P.V. Rs. '000	PVF _{20%}	P.V. Rs. '000
0	-500	1.00	-500.00	1.00	-500.00
1	85	0.91	77.35	0.83	70.55
2	200	0.83	166.00	0.69	138.00
3	240	0.75	180.00	0.58	139.20
4	220	0.68	149.60	0.48	105.60
5	70	0.62	43.40	0.41	28.70
	NPV		+116.35		-17.95

NPV of Project A at 10% (Cost of Capital) is Rs. 1,16,350.

IRR of Project A may be calculated by interpolation method as under:

NPV at 20% is (-) 17.95 (Rs. '000)

NPV at 10% is + 116.35 (Rs. '000)

$$\therefore \text{IRR} = 10 + \frac{116.35}{116.35 - (-17.95)} (20 - 10)\% = 18.66\%$$

For Project B:

Years	Cash flows (Rs. '000)	PVF 10%	P.V. (Rs. '000)	PVF 20%	P.V. (Rs. '000)
0	-500	1.00	-500	1.00	-500
1	480	0.91	436.80	0.83	398.40
2	100	0.83	83.00	0.69	69.00
3	70	0.75	52.50	0.58	40.60
4	30	0.68	20.40	0.48	14.40
5	20	0.62	12.40	0.41	8.20
	NPV		+105.10		+ 30.60

NPV of Project B at 10% (Cost of Capital) is Rs. 1,05,100.

IRR of Project B is calculated by interpolation method as under:

NPV at 10% = + 105.10 (Rs. '000)

NPV at 20% = + 30.60 (Rs. '000)

$$\text{IRR} = 10 + \frac{105.10}{105.10 - 30.60} (20 - 10)\% = 24.10$$

4.38 Financial Management

Note: Though in above solution discounting factors of 10% and 20% have been used. However, instead of 20%, students may assume any rate beyond 20%, say 26%, then NPV becomes negative. In such a case, the answers of IRR of Project may slightly varied from 24.10%.

(ii) The ranking of the projects will be as under:

	NPV	IRR
Project A	1	2
Project B	2	1

There is a conflict in ranking. IRR assumes that the project cash flows are reinvested at IRR whereas the cost of capital is 10%. The two projects are mutually exclusive. In the circumstances, the project which yields the larger NPV will earn larger cash flows. Hence the project with larger NPV should be chosen. Thus Project A qualifies for selection.

(iii) Inconsistency in ranking arises because if NPV criterion is used, Project A is preferable. If IRR criterion is used, Project B is preferable. The inconsistency is due to the difference in the pattern of cash flows.

Where an inconsistency is experienced, the projects yielding larger NPV is preferred because of larger cash flows which it generates. IRR criterion is rejected because of the following reasons:

- (i) IRR assumes that all cash flows are re-invested at IRR.
- (ii) IRR is a percentage but the magnitude of cash flow is important.
- (iii) Multiple IRR may arise if the projects have non-conventional cash flows.

Question 20

WX Ltd. has a machine which has been in operation for 3 years. Its remaining estimated useful life is 8 years with no salvage value in the end. Its current market value is Rs. 2,00,000. The company is considering a proposal to purchase a new model of machine to replace the existing machine. The relevant informations are as follows:

	Existing Machine	New Machine
Cost of machine	Rs. 3,30,000	Rs. 10,00,000
Estimated life	11 years	8 years
Salvage value	Nil	Rs. 40,000
Annual output	30,000 units	75,000 units
Selling price per unit	Rs. 15	Rs. 15
Annual operating hours	3,000	3,000
Material cost per unit	Rs. 4	Rs. 4

Labour cost per hour*	Rs. 40	Rs. 70
Indirect cash cost per annum	Rs. 50,000	Rs. 65,000

The company follow the straight line method of depreciation. The corporate tax rate is 30 per cent and WX Ltd. does not make any investment, if it yields less than 12 per cent. Present value of annuity of Re. 1 at 12% rate of discount for 8 years is 4.968. Present value of Re. 1 at 12% rate of discount, received at the end of 8th year is 0.404. Ignore capital gain tax.

Advise WX Ltd. whether the existing machine should be replaced or not.

* In the question paper this word was wrongly printed as 'unit' instead of word 'hour'. The answer provided here is on the basis of correct word i.e. 'Labour cost per hour'.

(PE-II-Nov. 2008) (8 marks)

Answer

(i) Calculation of Net Initial Cash Outflows:

	Rs.
Cost of new machine	10,00,000
Less: Sale proceeds of existing machine	<u>2,00,000</u>
Net initial cash outflows	<u>8,00,000</u>

(ii) Calculation of annual depreciation:

On old machine = $\frac{\text{Rs. } 3,30,000}{11 \text{ years}} = \text{Rs. } 30,000 \text{ per annum.}$

On new machine = $\frac{\text{Rs. } 10,00,000 - \text{Rs. } 40,000}{8 \text{ years}} = \text{Rs. } 1,20,000 \text{ per annum.}$

(iii) Calculation of annual cash inflows from operation:

Particulars	Existing machine	New Machine	Differential
(1)	(2)	(3)	(4) =(3) – (2)
Annual output	30,000 units	75,000 units	45,000 units
	Rs.	Rs.	Rs.
(A) Sales revenue @ Rs. 15 per unit	<u>4,50,000</u>	<u>11,25,000</u>	<u>6,75,000</u>
(B) Less: Cost of Operation			
Material @ Rs. 4 per unit	1,20,000	3,00,000	1,80,000
Labour			

4.40 Financial Management

Old = 3,000 × Rs. 40	1,20,000		90,000
New = 3,000 × Rs. 70		2,10,000	
Indirect cash cost	50,000	65,000	15,000
Depreciation	<u>30,000</u>	<u>1,20,000</u>	<u>90,000</u>
Total Cost (B)	<u>3,20,000</u>	<u>6,95,000</u>	<u>3,75,000</u>
Profit Before Tax (A – B)	1,30,000	4,30,000	3,00,000
Less: Tax @ 30%	<u>39,000</u>	<u>1,29,000</u>	<u>90,000</u>
Profit After Tax	91,000	3,01,000	2,10,000
Add: Depreciation	<u>30,000</u>	<u>1,20,000</u>	<u>90,000</u>
Annual Cash Inflows	<u>1,21,000</u>	<u>4,21,000</u>	<u>3,00,000</u>

(iv) Calculation of Net Present Value:

Rs.

Present value of annual net cash

Inflows: 1 – 8 years = Rs. 3,00,000 × 4.968 14,90,400

Add: Present value of salvage value of new machine at

the end of 8th year (Rs. 40,000 × 0.404) 16,160

Total present value 15,06,560

Less: Net Initial Cash Outflows 8,00,000

NPV **7,06,560**

Alternative Solution:

Calculation of Net Present Value (NPV)

Particulars	Period (Year)	Cash Flow (Rs.)	Present Value Factor (PVF) @ 12%	Present Value (Rs.)
Purchase of new machine	0	–8,00,000	1.00	–8,00,000
Incremental Annual Cash Inflow	1 – 8	3,00,000	4.968	14,90,400
Salvage value of new machine	8	40,000	0.404	<u>16,160</u>
Net Present Value (NPV)				<u>7,06,560</u>

Hence, existing machine should be replaced because NPV is positive.

Question 21

Do the profitability index and the NPV criterion of evaluating investment proposals lead to the same acceptance-rejection and ranking decisions? In what situations will they give conflicting results?
(Final-Nov. 1999) (6 marks)

Answer

In the most of the situations the Net Present Value Method (NPV) and Profitability Index (PI) yield same accept or reject decision. In general items, under PI method a project is acceptable if profitability index value is greater than 1 and rejected if it less than 1. Under NPV method a project is acceptable if Net present value of a project is positive and rejected if it is negative. Clearly a project offering a profitability index greater than 1 must also offer a net present value which is positive. But a conflict may arise between two methods if a choice between mutually exclusive projects has to be made. Consider the following example:

	Project A	Project B
PV of Cash inflows	2,00,000	1,00,000
Initial cash outflows	<u>1,00,000</u>	<u>40,000</u>
Net present value	1,00,000	60,000
P.I	$\frac{2,00,000}{1,00,000} = 2$	$\frac{1,00,000}{40,000} = 2.5$

According to NPV method, project A would be preferred, whereas according to profitability index method project B would be preferred.

This is because Net present value gives ranking on the basis of absolute value of rupees. Whereas profitability index gives ranking on the basis of ratio. Although PI method is based on NPV, it is a better evaluation technique than NPV in a situation of capital rationing.

Question 22

Distinguish between Net Present Value and Internal Rate of Return.

(Final-May 2002) (2 marks)

Answer

NPV and IRR: NPV and IRR methods differ in the sense that the results regarding the choice of an asset under certain circumstances are mutually contradictory under two methods. In case of mutually exclusive investment projects, in certain situations, they may give contradictory results such that if the NPV method finds one proposal acceptable, IRR favours another. The different rankings given by the NPV and IRR methods could be due to size disparity problem, time disparity problem and unequal expected lives.

The net present value is expressed in financial values whereas internal rate of return (IRR) is expressed in percentage terms.

In the net present value cash flows are assumed to be re-invested at cost of capital rate. In IRR reinvestment is assumed to be made at IRR rates.

4.42 Financial Management

Question 23

Discuss the need for social cost benefit analysis. (PE-II-May 2003 & Nov. 2006) (4 marks)

Answer

Several hundred crores of rupees are committed every year to various public projects. Analysis of such projects has to be done with reference to social costs and benefits. Since they cannot be expected to yield an adequate commercial return on the funds employed, at least during the short run.

Social cost benefit analysis is important for the private corporations also who have a moral responsibility to undertake socially desirable projects.

The need for social cost benefit analysis arises due to the following:

- (i) The market prices used to measure costs & benefits in project analysis, may not represent social values due to market imperfections.
- (ii) Monetary cost benefit analysis fails to consider the external positive & negative effects of a project.
- (iii) Taxes & subsidies are transfer payments & hence irrelevant in national economic profitability analysis.
- (iv) The redistribution benefits because of project needs to be captured.
- (v) The merit wants are important appraisal criteria for social cost benefit analysis.

Question 24

Write a short note on internal rate of return. (Final-May 1996 & Nov. 2008) (4 marks)

Answer

Internal Rate of Return: It is that rate at which discounted cash inflows are equal to the discounted cash outflows. In other words, it is the rate which discounts the cash flows to zero. It can be stated in the form of a ratio as follows:

$$\frac{\text{Cash inflows}}{\text{Cash Outflows}} = 1$$

This rate is to be found by trial and error method. This rate is used in the evaluation of investment proposals. In this method, the discount rate is not known but the cash outflows and cash inflows are known.

In evaluating investment proposals, internal rate of return is compared with a required rate of return, known as cut-off rate. If it is more than cut-off rate the project is treated as acceptable; otherwise project is rejected.

Question 25

Decision tree analysis is helpful in managerial decisions." Explain with an example. (PE-II-May 2005) (5 marks)

Answer

Significance of Decision Tree Analysis: it is generally observed that the present investment decision may have several implications for future investments decisions. Such complex investment decisions involve a sequence of decisions over time. It is also argued that since present choices modify future alternatives, industrial activity can not be reduced to a single decision and must be viewed as a sequence of decisions extending from the present time into the future. These sequential decisions are taken on the bases of decision tree analysis. While constructing and using decision tree, some important steps to be considered are as follows:

- (i) Investment proposal should be properly defined.
- (ii) Decision alternatives should be clearly clarified.
- (iii) The decision tree should be properly graphed indicating the decision points, chances, events and other data.
- (iv) The results should be analysed and the best alternative should be selected.

Question 26

What is Capital rationing? Describe various ways of implementing it.

(PE-II-Nov. 2008) (4 marks)

Answer

Capital Rationing: Generally, firms fix up maximum amount that can be invested in capital projects during a given period of time, say a year. The firm then attempts to select a combination of investment proposals that will be within the specific limits providing maximum profitability and rank them in descending order according to their rate of return; such a situation is of capital rationing.

A firm should accept all investment projects with positive NPV, with an objective to maximise the wealth of shareholders. However, there may be resource constraint due to which a firm may have to select from among various projects. Thus, capital rationing situation may arises when there may be internal or external constraints on procurement of necessary funds to invest in all investment proposals with positive NPVs.

Ways of implementing Capital Rationing

- (i) It may be implemented through budgets.
- (ii) It can be done by putting up a ceiling when it has been financing investment proposals only by way of retained earnings.
- (iii) It can also be done by 'Responsibility Accounting', whereby management may authorise a particular department to make investment only up to a specified limit, beyond which the investment decisions are to be taken by higher-ups.