

CHAPTER 9

Solved Problems

P.9.13 Swastik Ltd, manufacturers of special purpose machine tools, have two divisions which are periodically assisted by visiting teams of consultants. The management is worried about the steady increase of expenses in this regard over the years. An analysis of the last year's expenses reveals the following:

The management estimates accommodation expenses to increase by Rs 2,00,000 annually.

As part of cost reduction drive, Swastik Ltd is proposing to construct a consultancy centre to take care of the accommodation requirements of the consultants. This centre will additionally save the company Rs 50,000 in boarding charges and Rs 2,00,000 in the cost of executive training programme hitherto conducted outside the company's premises, every year.

The following details are available regarding the construction and maintenance of the new centre.

- (a) Land: at a cost of Rs 8,00,000 already owned by the company, will be used.
- (b) Construction: Rs 15,00,000 including special furnishing.
- (c) Cost of annual maintenance: Rs 1,50,000.
- (d) Construction cost will be written off (at a uniform rate) over 5 years, being the useful life.

Assuming that the write-off of construction cost as aforesaid will be accepted for tax purposes, that the rate of tax will be 35 per cent and that the desired rate of return is 15 per cent, you are required to analyse the feasibility of the proposal and make recommendations. Use present value up to two digits.

Solution

Financial feasibility of constructing consultancy centre

(Amount in lakh of rupees)

Particulars	Years				
	1	2	3	4	5
Cost savings:					
Accommodation expenses	8	10	12	14	16
Boarding charges	0.5	0.5	0.5	0.5	0.5
Hire charges of executive training programme	2.0	2.0	2.0	2.0	2.0
Total	10.5	12.5	14.5	16.5	18.5
Less: Cost of annual maintenance	1.5	1.5	1.5	1.5	1.5
Less: Amortization of construction cost	3.0	3.0	3.0	3.0	3.0
Net savings/EBT	6.0	8.0	10.0	12.0	14.0
Less: Taxes (0.35)	2.1	2.8	3.5	4.2	4.9
EAT	3.9	5.2	6.5	7.8	9.1
CFAT	6.9	8.2	9.5	10.8	12.1
(x) PV factor at (0.15)	0.87	0.76	0.66	0.57	0.50
Present value	6.00	6.23	6.27	6.16	6.05
Total present value ($t = 1 - 6$)					30.71
Less: Incremental CO					15.00
NPV					15.71

Recommendation It is desirable for the company to construct its own consultancy centre.

Notes:

- (i) Land cost does not involve any additional cash flows.
- (ii) The firm will continue to incur expenses namely, consultants' remuneration, travel and conveyance and special allowances, and, hence, ignored.

P.9.14 A plastic manufacturing company is considering replacing an older machine which was fully depreciated for tax purposes with a new machine costing Rs 40,000. The new machine will be depreciated over its eight-year life. It is estimated that the new machine will reduce labour costs by Rs 8,000 per year. The management believes that there will be no change in other expenses and revenues of the firm due to the machine. The company requires an after-tax return on investment of 10 per cent. Its rate of tax is 35 per cent. The company's income statement for the current year is given for other informations.

Income statement for the current year

Sales		Rs 5,00,000
Costs:		
Materials	Rs 1,50,000	
Labour	2,00,000	
Factory and administrative	40,000	
Depreciation	40,000	4,30,000
Net income before taxes		70,000
Taxes (0.35)		24,500
Earnings after taxes		45,500

Should the company buy the new machine? You may assume the company follows straight line method of depreciation and the same is allowed for tax purposes.

Solution

Cash inflows:		
(i) Present: Earnings after taxes		Rs 45,500
Add: Depreciation		40,000
CFAT (present)		85,500
(ii) Estimated CFAT, if the new machine is purchased:		
Sales		5,00,000
Costs:		
Material	Rs 1,50,000	
Labour	1,92,000	
Factory and administrative	40,000	
Depreciation (including Rs 5,000 on new machine)	45,000	4,27,000
Net income before taxes		73,000
Taxes		25,550
Earnings after taxes		47,450
Add: Depreciation		45,000
CFAT (expected)		92,450
(iii) Differential cash flow: Rs 92,450 – Rs 85,500		6,950

(iv) Determination of NPV

Years	CFAT	PV factor (0.10)	Total PV
1-8	Rs 6,950	5.335	Rs 37,078
Less: Cost of new machine			40,000
NPV			(2,922)

Recommendation Since the NPV is negative, the new machine should not be purchased.

P.9.15 The United Petroleum Ltd (UPL) has a retail outlet of petrol, diesel and petroleum products. Presently, it has two pumps exclusively for petrol, one for non-lead petrol and one for diesel. Free air filling is carried out for vehicles buying fuel from the outlet. The pumps have a useful life of 10 years with no salvage value as the underground tank will be completely corroded and unfit for reuse.

The UPL sells petrol and diesel @ Rs 23 and Rs 10 per litre respectively. The existing annual sale is petrol, 5 lakh litres, and diesel, 2 lakh litres. Its earnings are 4 per cent as commission on sales.

Due to a manifold increase in traffic, the existing pumps are not able to meet the demand during peak hours. The UPL is contemplating installation of additional pumps for diesel and petrol at a cost of Rs 10,00,000 together with additional working capital of Rs 5,00,000. The additional sales of petrol and diesel are expected to be 2 lakh litres and 1 lakh litres per annum respectively. As a result of the installation of the new pump, the operating cost would increase by Rs 24,000 annually by way of salary of the pump operator. Other yearly associated additional costs are estimated to be: insurance @ 1 per cent of the cost of the pump, maintenance cost, Rs 12,000 and power costs, Rs 13,000.

United Petroleum Ltd pays 35 per cent on tax on its income. Depreciation will be on straight line basis and the same is allowed for tax purposes.

The management of UPL seeks your advice on the financial viability of the expansion proposal. Prepare a report for its consideration, assuming 12 per cent required rate of return.

Solution

Financial analysis for setting up additional pumps (using NPV method)

Cash outflows:		
Cost of new pump		Rs 10,00,000
Increase in working capital		5,00,000
		15,00,000
Incremental CFAT and NPV (years (1 - 10):		
Commission on incremental sales		
Petrol: 2 lakhs × Rs 23 × 0.04		1,84,000
Diesel: 1 lakh × Rs 10 × 0.04		40,000
		2,24,000
Less: Incremental costs:		
Salary	Rs 24,000	
Insurance	10,000	
Maintenance costs	12,000	
Power costs	13,000	
Depreciation (Rs 10 lakh/10)	1,00,000	1,59,000
Earnings before taxes		65,000
Less: Taxes		22,750
Earnings after taxes		42,250
CFAT (EAT + D)		1,42,250
(x) PV factor for annuity for 10 years (0.12)		5.650
Present value		8,03,713
Add: PV of recovery of working capital (Rs 5,00,000 × 0.322)		1,61,000
Total present value		9,64,713
Less: Cash outflows		15,00,000
NPV		(5,35,287)

Recommendation Since NPV is negative, the installation of additional pumps is not financially viable.

P.9.16 Senior executives of Laxmi Rice Mill Ltd have been considering the proposal to replace the existing coal-fired furnace in the paddy boiling section by a new furnace is cyclone type husk-fired furnace. The capital cost of the new furnace is expected to be Rs 1 lakh. It will have useful life of 10 years at the end of which period its residual value will be negligible. The present furnace has a book value of Rs 15,000 and can be used for another 10 years with only minor repairs. If scrapped now, it can fetch Rs 10,000 but it cannot fetch any amount if scrapped after ten more years of use.

The basic advantage of the new furnace is that it does not depend on the coal whose supplies are becoming increasingly erratic in recent years. On a conservative estimate, the new furnace will result in a saving of Rs 25,000 per annum on account of eliminated coal cost. However, the cost of electricity and other operating expenses are likely to go up by Rs 8,000 and Rs 4,000 per annum respectively.

The husk which results as a by-product during the normal milling operations at 3,000 metric ton of paddy milled per year is considered adequate for operating the new furnace. On an average, for every metric ton of paddy milled, the husk content is 20 per cent. At present, the husk resulting during the milling operations is sold at a price of Rs 50 per metric ton. Once the new furnace is installed, the husk will be diverted for own use. 'White Ash' which constitutes about 5 percent of the husk burnt in the new furnace, will be collected in a separate ash-pit as it has considerable demand in the refractory industry. It can be sold very easily at a price of Rs 1,500 per metric ton.

The new furnace will require a motor of 15 HP, whose cost is not included in Rs 1 lakh, the capital cost of the furnace. A 15 HP motor is lying idle with the polishing section of the Mill which can fetch an amount of Rs 3,000 on sale. It has a net book value of Rs 5,000. The motor can be used for the new furnace. At the end of the ten years, it can be scrapped at zero residual value.

All the assets of the company are in the same block. Depreciation will be on straight line basis and the same is assumed to be acceptable for tax purpose as well. Applicable tax rate is 35 per cent and cost of capital is 12 per cent.

Required:

(i) Formulate the incremental net after-tax cash flows associated with the replacement project. (ii) Also calculate the project's NPV. (iii) Give your recommendation.

Solution

Financial analysis of replacement decision

Incremental cash outflows:	
Cost of new furnace	Rs 1,00,000

Add: Salvage value of 15 HP motor		3,000
Less: Sale proceeds of existing furnace		10,000
Investment in new furnace		93,000
Incremental CFAT and NPV:		
Savings and revenue on installation of new furnace:		
Reduction in coal cost (not required)		25,000
Sale of white ash ($3,000 \times 20/100 \times 5/100 \times \text{Rs } 1,500$)		45,000
		70,000
Less: Cash incremental costs:		
Electricity costs	Rs 8,000	
Operating expenses	4,000	
Contribution lost due to use of husk ($3,000 \times 20/100 \times \text{Rs } 50$)	30,000	42,000
Incremental depreciation:		
Book value of existing machines/furnace ($\text{Rs } 15,000 + \text{Rs } 5,000$)	20,000	
Add: Cost of new furnace	1,00,000	
Less: Sale proceeds of existing furnace	(10,000)	
Depreciation base of new machine	1,10,000	
Less: Existing depreciation base	(20,000)	
Basic of incremental depreciation	90,000	
Depreciation per year Rs 90,000/10 years		9,000
<i>(Contd.)</i>		
Earnings before taxes		19,000
Less: Taxes, 35 per cent		6,650
EAT		12,350
CFAT		21,350
(x) PV factor for 10 years annuity at 12 per cent		5,650
Total PV		1,20,627
Less: Cash outflows		93,000
NPV		27,627

Recommendation As NPV is positive, the company is advised to replace the existing coal-fired furnace by new furnace.

P.9.17 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 5 years with no residual value.

The company has an offer for sale of Machine-R at Rs 1,00,000. The cost of dismantling and removal will be 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 per cent.

- Advise whether the company should opt for replacement.
- 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?

Solution Financial evaluation of whether to replace Machine-R

(i) Incremental cash outflows

Cost of Machine-S		Rs 2,50,000
Less: Effective sale proceeds of Machine-R ($\text{Rs } 1,00,000 - \text{Rs } 30,000$, dismantling/removal costs)		70,000
		1,80,000
Incremental cash inflows and NPV (for years $t = 1 - 5$)		
Savings in annual operating costs:		
Annual cash operating costs (R)	Rs 2,00,000	
Annual cash operating costs (S)	1,80,000	20,000
(x) PV factor of annuity for 5 years (0.14)		$\times 3.433$

Total present value	68,660
Less: Incremental cash outflows	1,80,000
NPV	(1,11,340)

Recommendation Since NPV is negative, the company is advised not to replace Machine-R.

(ii) Financial evaluation of Machine-R and S (determination of NPV)

<i>Particulars</i>	<i>Machine-R</i>	<i>Machine-S</i>
Sales revenue (1,50,000 × Rs 6)	Rs 9,00,000	Rs 9,00,000
Less: Operating costs	2,00,000	1,80,000
Less: Fixed costs (1,50,000 × Rs 3)	4,50,000	4,50,000
<i>(Contd.)</i>		
Annual cash inflows	2,50,000	2,70,000
(x) PV factor of annuity for 5 years (0.14)	(×) 3.433	(×) 3.433
Total present value	8,58,250	9,26,910
Less: Cash outflows	2,00,000	2,50,000
Net present value	6,58,250	6,76,910

Recommendation As NPV of Machine-S is higher, the company is advised to opt for Machine-S

Note: As the company is a zero-tax company for seven years and life of both the machines is five years only, depreciation aspect is not relevant.

P.9.18 Band-Box is considering the purchase of a new wash and dry equipment in order to expand its operations. Two types of options are available: a low-speed system (LSS) with a Rs 20,000 initial cost and a high speed system (HSS) with an initial cost of Rs 30,000. Each system has a fifteen year life and no salvage value. The net cash flows after taxes (CFAT) associated with each investment proposal are:

	<i>Low speed system (LSS)</i>	<i>High speed system (HSS)</i>
CFAT for years 1 through 15	Rs 4,000	Rs 6,000

Which speed system should be chosen by Band-Box, assuming 14 per cent cost of capital?

Solution

Determination of NPV					
<i>Years</i>	<i>CFAT</i>	<i>PV factor (0.14)</i>	<i>Total PV</i>		
	<i>LSS</i>	<i>HSS</i>	<i>LSS</i>	<i>HSS</i>	
1-15	Rs 4,000	Rs 6,000	6.142	Rs 24,568	Rs 36,852
Less: Initial cost				20,000	30,000
NPV				4,568	6,852

The high speed system should be chosen by Band-Box as its NPV is greater.

P.9.19 Welcome Limited is considering the manufacture of a new product. They have prepared the following estimate of profit in the first year of manufacture:

Sales, 9,000 units @ Rs 32		Rs 2,88,000
Cost of goods sold:		
Labour 40,000 hours @ Rs 3.50 per hour	Rs 1,40,000	
Materials and other variable costs	65,000	
Depreciation	45,000	
	2,50,000	
Less: Closing stock	25,000	2,25,000
Net profit		63,000

The product is expected to have a life of four years. Annual sales volume is expected to be constant over the period at 9,000 units. Production which was estimated at 10,000 units in the first year would be only 9,000 units each in year two and three and 8,000 units in year four. Debtors at the end of each year would be 20 per cent of sales during the year; creditors would be 10 per cent of materials and other variable costs. If sales differed from the forecast level, stocks would be adjusted in proportion.

Depreciation relates to machinery which would be purchased especially for the manufacture of the new product and is calculated on the straight line basis assuming that the machinery would last for four years and have no terminal scrap value. Fixed costs are included in labour cost.

There is high level of confidence concerning the accuracy of all the above estimates except the annual sales volume. Cost of capital is 20 per cent per annum. You may assume that debtors are realised and creditors are paid in the following year. No changes in the prices of inputs or outputs are expected over the next four years.

You are required to show whether the manufacture of the new product is worthwhile. Ignore taxes.

Solution Cash outflows:

Cost of the machine (Depreciation per year × years of useful life of the machine, i.e. Rs 45,000 × 4)					Rs 1,80,000
Cash inflows and NPV					
Particulars	Year				
	1	2	3	4	5
Sales revenue	Rs 2,88,000	Rs 2,88,000	Rs 2,88,000	Rs 2,88,000	
Less: Expenses:					
Labour cost	1,40,000	1,26,000	1,26,000	1,12,000	
Materials and other					
Variable costs	65,000	58,500	58,500	52,000	
Funds inflows	83,000	1,03,500	1,03,500	1,24,000	
Less: Debtors outstanding	57,600	57,600	57,600	57,600	
Add: Receipts from debtors	—	57,600	57,600	57,600	Rs 57,600
Add: Creditors outstanding	6,500	5,850	5,850	5,200	
Less: Payments to creditors	—	6,500	5,850	5,850	5,200
Cash inflows	31,900	1,02,850	1,03,500	1,23,300	52,400
(x) PV factor	0.833	0.694	0.579	0.482	0.402
Present Value	26,573	71,378	59,927	59,455	21,065
Total PV (year, <i>t</i> = 1-5)					2,38,398
Less: Cash outflows					1,80,000
NPV					58,398

Since the NPV is positive, the manufacture of new product is worthwhile.

P.9.20 A company is currently considering modernisation of a machine originally costing Rs 50,000 (current book value zero). However, it is in a good working condition and can be sold for Rs 25,000. Two choices are available. One is to rehabilitate the existing machine at a total cost of Rs 1,80,000; and the other is to replace the existing machine with a new machine costing Rs 2,10,000 and requiring Rs 30,000 to install. The rehabilitated machine as well as the new machine would have a six year life and no salvage value. The projected after-tax profits under the various alternatives are:

Year	Expected after-tax profits		
	Existing machine	Rehabilitated machine	New machine
1	Rs 2,00,000	Rs 2,20,000	Rs 2,40,000
2	2,50,000	2,90,000	3,10,000
3	3,10,000	3,50,000	3,50,000
4	3,60,000	4,00,000	4,10,000
5	4,10,000	4,50,000	4,30,000
6	5,00,000	5,40,000	5,10,000

The firm is taxed at 35 per cent. The company uses the straight line depreciation method and the same is allowed for tax purposes. Ignore block assets concept. The cost of capital is 12 per cent.

Advise the company whether it should rehabilitate the existing machine or should replace it with the new machine. Also, state the situation in which the company would like to continue with the existing machine.

Solution

Cash outflows	
(i) If machine is rehabilitated:	
Rehabilitation costs	Rs 1,80,000
(ii) If machine is purchased:	
Cost of new machine	2,10,000

Add: Installation cost	30,000
Less: Effective sale value of old machine (Rs 25,000 – Rs 8,750, tax)	(16,250)
Incremental cash outflows	2,23,750

Cash inflows after taxes							
<i>Existing machine</i>		<i>Rehabilitated machine</i>			<i>New machine</i>		
<i>Year</i>	<i>EAT/ CFAT^a</i>	<i>EAT</i>	<i>D</i>	<i>CFAT</i>	<i>EAT</i>	<i>D</i>	<i>CFAT</i>
1	Rs 2,00,000	Rs 2,20,000	Rs 30,000	Rs 2,50,000	Rs 2,40,000	Rs 40,000	Rs 2,80,000
2	2,50,000	2,90,000	30,000	3,20,000	3,10,000	40,000	3,50,000
3	3,10,000	3,50,000	30,000	3,80,000	3,50,000	40,000	3,90,000
4	3,60,000	4,00,000	30,000	4,30,000	4,10,000	40,000	4,50,000
5	4,10,000	4,50,000	30,000	4,80,000	4,30,000	40,000	4,70,000
6	5,00,000	5,40,000	30,000	5,70,000	5,10,000	40,000	5,50,000

^aSince the existing machine has been fully depreciated (book value being zero), no depreciation would be added to determine CFAT.

Determination of NPV					
<i>Year</i>	<i>Incremental CFAT</i>			<i>Total PV</i>	
	<i>Rehabilitated machine</i>	<i>New machine</i>	<i>PV factor (0.12)</i>	<i>Rehabilitated machine</i>	<i>New machine</i>
1	Rs 50,000	Rs 80,000	0.893	Rs 44,650	Rs 71,440
2	70,000	1,00,000	0.797	55,790	79,700
3	70,000	80,000	0.712	49,840	56,960
4	70,000	90,000	0.636	44,520	57,240
5	70,000	60,000	0.567	39,690	34,020
6	70,000	50,000	0.507	35,490	25,350
Total present value				2,69,980	3,24,710
Less: Initial cash outflows				1,80,000	2,23,750
NPV				89,980	1,00,960

Recommendation Since NPV of the new machine is more, the company should buy it. If the NPV of incremental CFAT of both the alternatives were negative, the company would have continued with the existing machine.

P.9.21 Excel Ltd manufactures a special chemical for sale at Rs 30 per kg. The variable cost of manufacture is Rs 15 per kg. Fixed cost excluding depreciation is Rs 2,50,000. Excel Ltd is currently operating at 50 per cent capacity. It can produce a maximum of 1,00,000 kg at full capacity.

The production manager suggests that if the existing machines are replaced, the company can achieve maximum capacity in the next 5 years gradually increasing the production by 10 per cent a year.

The finance manager estimates that for each 10 per cent increase in capacity, the additional increase in fixed cost will be Rs 50,000. The existing machines with a current book value of Rs 10,00,000 and remaining useful life of 5 years can be disposed of for Rs 5,00,000. The vice-president (finance) is willing to replace the existing machines provided the NPV on replacement is Rs 4,53,000 at 15 per cent cost of capital. PV factor may be used up to two digits only.

- (i) You are required to compute the total value of machines necessary for replacement. For your exercise you may assume the following:
 - (a) All the assets are in the same block. Depreciation will be on straight line basis and the same is allowed for tax purposes.
 - (b) There will be no salvage value for the new machines. The entire cost of the assets will be depreciated over a five year period.
 - (c) Tax rate is 40 per cent.
 - (d) Cash inflows will accrue at the end of the year.
 - (e) Replacement outflow will be at the beginning of the year (year 0).
- (ii) On the basis of data given above, the managing director feels that the replacement, if carried out, would at least yield a post-tax return of 15 per cent in three years provided the capacity build up is 60, 80 and 100 per cent respectively. Do you agree?

Solution Determination of total replacement value of machines**(i) (a) Incremental cash outflows**

Cost of replacement of new machines	Rs X
Less: Disposal value of existing machines	5,00,000
Cash outflows required	(X – Rs 5,00,000)

(b) Determination of CFAT and NPV (excluding depreciation)

Particulars	Years				
	1	2	3	4	5
Increased production and sales (Kg)	10,000	20,000	30,000	40,000	50,000
(x) contribution per unit					
(Rs 30 – Rs 15) (Rs)	15	15	15	15	15
Incremental contribution	1,50,000	3,00,000	4,50,000	6,00,000	7,50,000
Less: Incremental fixed costs	50,000	1,00,000	1,50,000	2,00,000	2,50,000
Incremental profit before taxes	1,00,000	2,00,000	3,00,000	4,00,000	5,00,000
Less: Taxes (0.40)	40,000	80,000	1,20,000	1,60,000	2,00,000
Earnings after taxes	60,000	1,20,000	1,80,000	2,40,000	3,00,000
(x) PV factor (0.15)	0.87	0.76	0.66	0.57	0.49
Present value	52,200	91,200	1,18,800	136,800	1,47,000
Total PV for 5 years ($t = 1 - 5$)					5,46,000

(c) Base for incremental depreciation

Current book value of existing machine	Rs 10,00,000
Add: Cost of new machine	X
Less: Sale proceeds of existing machine	5,00,000
Depreciation base of new machine	X + 5,00,000
Less: Depreciation base of existing machine	10,00,000
Base for incremental depreciation	X – 5,00,000

(d) PV of tax savings on incremental depreciation for years 1 - 5

Incremental depreciation per year	
(X – Rs 5,00,000) ÷ 5	0.2X – Rs 1,00,000
(x) Tax rate	0.40
(x) PV factor of annuity for 5 years	3.35
(0.2 X – Rs 1,00,000) × 0.40 × 3.35 = 0.268X – Rs 1,34,000	

(e) Total PV (b + d) = Rs 5,46,000 + 0.268X – Rs 1,34,000**(f)** Desired NPV = PV of CFAT – PV of outflows

$$\text{Rs } 4,53,000 = (\text{Rs } 4,12,000 + 0.268X) - (X - \text{Rs } 5,00,000)$$

$$\text{Rs } 4,53,000 = \text{Rs } 4,12,000 + 0.268X - X + \text{Rs } 5,00,000$$

$$\text{Or } 0.732X = \text{Rs } 4,59,000 \text{ Or } X = \text{Rs } 4,59,000 / 0.732 = \text{Rs } 6,27,049$$

Total value of machines required for replacement is Rs 6,27,049.

(ii) Financial evaluation whether replacement would yield post-tax return of 15 per cent in 3 years

Particulars	Year		
	1	2	3
Increased capacity (per cent)	10	30	50
Increased sales (kg)	10,000	30,000	50,000
Incremental contribution (@ Rs 15 per kg)	Rs 1,50,000	Rs 4,50,000	Rs 7,50,000
Less: Incremental fixed cost	50,000	1,50,000	2,50,000
Less: Incremental depreciation			
(Rs 11,27,049 – Rs 10,00,000) ÷ 5 years	25,410	25,410	25,410
Earnings before taxes	74,590	2,74,590	4,74,590
Less: Taxes (0.40)	29,836	1,09,836	1,89,836
Earnings after taxes	44,754	1,64,754	2,84,754
CFAT	70,164	1,90,164	3,10,164
(x) PV factor (0.15)	0.87	0.76	0.66

Present value	61,043	1,44,525	2,04,708
Total present value ($t = 1 - 3$)			4,10,276
Less: Incremental cash outflows			1,27,049
NPV			2,83,227

The assessment of the managing director is correct as the NPV is positive.

Review Questions

- 9.15** A large sized chemical company is considering investing in a project that costs Rs 5,00,000. The estimated salvage value is zero; tax rate is 35 per cent. The company uses straight line depreciation for tax purposes and the proposed project has cash flows before tax (CFBT) as follow:
Determine the following: (a) Pay back period, and (b) Average rate of return.
- 9.16** A company wants to purchase a plant for its expanding operations. The desired plant is available at Rs 3,00,000 in cash or Rs 4,50,000 to be paid in 5 equal annual instalments due at the end of each year. Assuming the required rate of return of 15 per cent, which option should the company exercise? Ignore taxes.
- 9.17** A company is contemplating the introduction of a new machine. From the following information given to you, determine the profitability of the project, assuming 10 per cent as the cost of capital:

Year	0	1	2	3	4	5
Cash outflows at year-end	Rs 40,000	—	—	Rs 30,000	—	—
Net cash inflows at year-end	—	Rs 20,000	Rs 20,000	—	Rs 40,000	Rs 80,000

- 9.18** A company owns a machine which is in current use. It was purchased for Rs 1,60,000 and had a projected life of 8 years with Rs 10,000 salvage value. It has been depreciated @ 25 per cent on written down value basis for 3 years to date and could be sold for Rs 30,000.

A new machine can be purchased at a total cost of Rs 2,60,000. It will have a 5 year life, salvage value other machines in the same block @ 25 per cent on written down value basis. It is estimated that the new machine will reduce labour expenses by Rs 50,000 per year and net working capital requirement will be Rs 20,000. The tax rate is 35 per cent while the required rate of return is 12 per cent.

The income statement for the firm using the current machine for the current year is as follows:

Sales	Rs 20,00,000
Labour	Rs 7,00,000
Material	5,00,000
Depreciation	2,00,000
Total costs	14,00,000
Earnings before taxes	6,00,000
Income tax	2,10,000
After tax profit	3,90,000

Determine whether the new machine should be purchased.

- 9.19** A company is considering the purchase of a delivery van and is evaluating the following two choices:
- The company can buy a used van for Rs 20,000, after 4 years sell the same for Rs 2,500 (net of taxes) and replace it with another used van which is expected to cost Rs 30,000 and last 6 years with no terminating value.
 - The company can buy a new van for Rs 40,000. The projected life of the van is 10 years and has an expected salvage value (net of taxes) of Rs 5,000 at the end of ten years.

The services provided by the vans under both choices are the same. Assuming the cost of capital 10 per cent, which choice is preferable?

- 9.20** A toy manufacturing company is considering replacing an existing piece of equipment with one of two new, more sophisticated machines.

The old machine was purchased three years ago at a cost of Rs 70,000. The machine originally had a projected life of 7 years and was to be depreciated straight line for tax purposes to zero salvage value.

The two new pieces of equipment being considered are machine X and machine Y. Machine X would cost Rs 80,000 to purchase and Rs 20,000 to install. Due to the expansion in operation, the management estimates the net working capital requirement of machine X at Rs 10,000. It has a 4 year life with no salvage value. It will be depreciated straight line for tax purposes.

Machine Y would cost Rs 1,15,000 and Rs 25,000 to install. It also has a 4 year life with no salvage value. This machine would require net working capital of Rs 20,000.

The old machines can be sold for Rs 25,000 on one-year credit. The firm is taxed at 35 per cent. Assume that loss on sale of existing machine can be claimed as short-term capital loss in the current year itself.

The projected profits before depreciation and taxes currently and with each of the new machines are as follows:

<i>Year</i>	<i>With present machine</i>	<i>With machine X</i>	<i>With machine Y</i>
1	Rs 25,000	Rs 50,000	Rs 90,000
2	25,000	50,000	90,000
3	25,000	50,000	90,000
4	25,000	50,000	90,000

Assuming the cost of capital to be 10 per cent, which machine should the company acquire?

What would be your answer, if the company has under consideration only the proposal of the purchase of machine X?

- 9.21** A company is considering two mutually exclusive investments. Both projects involve a cash outlay of Rs 50,000. The estimated after-tax net cash inflows of project X are Rs 10,000 per year for 10 years, and of project Y, Rs 16,209.44 per year for 5 years.

(a) Which project should be acceptable to the company at 10 per cent cost of capital?

(b) Is your decision affected if (i) cost of capital rises to 12 per cent and (ii) falls to 8 per cent?

- 9.22** A company is planning to purchase a machine to meet the increased demand for its products in the market. The machine costs Rs 50,000 and has no salvage value. The expected life of the machine is 5 years, and the company employs straight line method of depreciation for tax purposes. The estimated earnings after taxes are Rs 5,000 each year for 5 years. The after-tax required rate of return of the company is 12 per cent.

Determine the IRR. Also, find the pay back period and obtain the IRR from it. How do you compare this IRR with the one directly estimated? What are the reasons for the differences between the two IRRs so estimated?

- 9.23** A textile company is considering two mutually exclusive investment proposals for its expansion programme. Proposal A requires an initial investment of Rs 7,50,000 and yearly operating costs of Rs 50,000. Proposal B requires an initial investment of Rs 5,00,000 and yearly operating costs of Rs 1,00,000. The life of the equipment used in both the investment proposals will be 12 years with no salvage value; depreciation is on straight line basis for tax purposes. The anticipated increase in revenues is Rs 1,50,000 per year in both the investment proposals. The tax rate is 35 per cent and cost of capital, 15 per cent. Which investment proposal should be undertaken by the company?

- 9.24** A machine purchased four years ago has been depreciated @ 25 per cent on reducing balance to a book value of Rs 50,000. The machine originally had a projected life of 10 years and zero salvage value.

A new machine will cost Rs 1,30,000. Its installation cost estimated by the technician is Rs 20,000. It is also estimated that the installation of the new machine will result in a reduced operating cost of Rs 30,000 per year for next 6 years. The old machine could be sold for Rs 20,000. The new machine will have a 6 year life with no salvage value. The company's normal income is taxed at 35 per cent.

Assuming the cost of capital of 10 per cent, determine whether the existing machine should be replaced. This 25 per cent block of assets will cease to exist at the end of 6 years.

Answers

- 9.15** (a) 4.18 years, (b) 13% (accounting basis), 55.4% (cash basis).

- 9.16** Cash option.

- 9.17** NPV Rs 49,170.

- 9.18** No. (NPV – Rs 1,33,945).

- 9.19** Choice 2: PV of cash outflows is Rs 38,070 (choice 2), PV of cash outflows is Rs 38,782.50 (choice 1).

- 9.20** (i) Machine Y (NPV is Rs 1,05,912), NPV of Machine X is Rs 55,567. (ii) Continue with existing machine (NPV is Rs 62,607).
- 9.21** (a) Both projects (b) (i) Project Y (ii) Project X.
- 9.22** PB period 3.333 years, IRR 15.4%, IRR with the help of PB period, 30%. The life of the project is not twice that of the PB period.
- 9.23** Proposal B, PV of savings in Proposal A is Rs 2,15,805 as against the additional cost of Rs 2,50,000.
- 9.24** No. (NPV – Rs 24,315).