Chapter wise Test (2005)
Investment Decision

Instructions

- All questions are compulsory.
- Test Duration will be 60 Minutes, starting from 11:00 AM to 12:00 noon
- 5 minutes reading time will be provided before 11, i.e. question paper will be shared by 10:55 AM.
- Share your scanned answer sheets by 12:10 on below link https://forms.gle/wLRZWiTvMELNpCeC6

1. [5 Marks] ABC Ltd. is considering to purchase a machine which is priced at Rs. 5,00,000. The estimated life of machine is 5 years and has an expected salvage value of Rs. 45,000 at the end of 5 years. It is expected to generate revenues of Rs. 1,50,000 per annum for five years. The annual operating cost of the machine is Rs. 28,125, Corporate Tax Rate is 20% and the cost of capital is 10%.
You are required to analyse whether it would be profitable for the company to purchase the machine by using;
   (i) Payback period Method
   (ii) Net Present value method
   (iii) Profitability Index Method

Solution

Computation of Annual Cash Flows

Particular	(Rs.)
Revenue	1,50,000
Less: Operating Cost	(28,125)
Less: Depreciation $\frac{(5,00,000-45,000)}{5}$	(91,000)
Profit before Tax	30,875
Less: Tax	(6,175)
Profit after Tax	24,700
Add: Depreciation	91,000
Annual Cash Inflows	1,15,700

(i) Computation of Payback Period

Year	Cash Flows	Cumulative Present Value
1	1,15,700	1,15,700
2	1,15,700	2,31,400
3	1,15,700	3,47,100
4	1,15,700	4,62,800

5 (Including Salvage)	1,60,700	6,23,500

Amount to be recovered in 5th year cash flow = Rs. 5,00,000 – Rs. 4,62,800 = Rs. 37,200

Payback period = 4 years + $\frac{37,200}{1,60,700}$ = 4.23 years

Since the payback period is less than the life of machinery, the company may purchase the machine.

(ii) Computation of Net Present Value

Year	Cash Flows	PVF @10%	Present Value
0	(5,00,000)	1.000	(5,00,000)
1 - 5	1,15,700	3.791	4,38,594
5	45,000	0.621	27,941
Net Present Value			(33,465)

Since the net present value (NPV) is negative, the company should not purchase the machine.

(iii) Computation of Profitability Index (PI)

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

$$= \frac{Rs.\,4,38,594 + Rs.\,27,941}{Rs.\,5,00,000} = 0.93$$

Since the profitability index is less than 1, the company should not purchase the machine.

2. [8 Marks] NC Ltd. Is considering purchasing a new machine to increase its production facility. At present, it uses an old machine which can process 5,000 units of TVs per week. NC could replace it with new machine, which is product specific and can produce 15,000 units per week. New machine cost ` 100 crores and requires the working capital of ` 3 crores, which will be released at the end of 5th year. The new machine is expected to have a salvage value of ` 20 crores.

The company expects demand for TVs to be 10,000 units per week. Each TV sells for ` 30,000 and has Profit Volume Ratio (PV) of 0.10. The company works for the 56 weeks in the year. Additional fixed costs (excluding depreciation) are estimated to increase by ` 10 crores. The company is subject to a 40% tax rate and its after-tax cost of capital is 20%. The relevant rate of depreciation is 25 % for both taxation and accounts. The company uses the WDV method of depreciation. The existing machine will have no scrap value.

You are required to:

ADVISE whether the company should replace the old machine. (Decimal may be taken up to 2 units)

Solution

Cash inflows after tax (CFAT)

Particular	₹
Current production (units per week)	5,000 units
New capacity (units per week)	15,000 units
Demand (units per week)	10,000 units
Increase in sales (units per week) A.	5,000 units
Contribution per unit (₹ 30,000 x 0.10) B.	3,000
Increase in contribution A x B x 56	84 crores
Less: Additional fixed cost	10 crores
Increase in profit	74 crores
Less: Tax @ 40%	29.6 crores
Profit after tax	44.4 crores

Tax shield due to depreciation

Year	Depreciation (₹ in Crore)	Tax Shield (₹ in Crore)	PV Factor @ 20%	Total Present Value (₹ in Crore)
1	25.00	10	0.83	8.33
2	18.75	7.5	0.69	5.18
3	14.06	5.62	0.58	3.26
4	10.55	4.22	0.48	2.03
5	7.91	3.16	0.40	1.27
Total				20.07

Tax shield on capital loss = (23.73-20.00) x 30% = ₹ 1.12 crores

Net Present Value (NPV)

Particulars	Year	Cash Flow (₹ in Crores)	PVAF @ 20%	Present Value (₹ in Crores)
Initial Investment	0	(100)	1	(100)
Working capital	0	(3)	1	(3)
Profit after tax	1-5	44.4	2.99	132.76
Salvage value	5	20	0.40	8.00
Tax shield on Depreciation	1-5			20.07
Tax shield on capital loss	5	1.12	0.40	0.45
Release of Working Capital	5	3	0.40	1.20
NPV				59.47

The company is advised to replace the old machine since the NPV of the new machine is positive.

3. [8 Marks] Four years ago, Z Ltd. had purchased a machine of Rs. 4,80,000 having estimated useful life of 8 years with zero salvage value. Depreciation is charged using SLM method over the useful life. The company want to replace this machine with a new machine. Details of new machine are as below:
   - Cost of new machine is Rs. 12,00,000, Vendor of this machine is agreed to take old machine at a value of Rs. 2,40,000. Cost of dismantling and removal of old machine will be Rs. 40,000. 80% of net purchase price will be paid on

spot and remaining will be paid at the end of one year.
- Depreciation will be charged @ 20% p.a. under WDV method.
- Estimated useful life of new machine is four years and it has salvage value of Rs. 1,00,000 at the end of year four.
- Incremental annual sales revenue is Rs. 12,25,000.
- Contribution margin is 50%.
- Incremental indirect cost (excluding depreciation) is Rs. 1,18,750 per year.
- Additional working capital of Rs. 2,50,000 is required at the beginning of year and Rs. 3,00,000 at the beginning of year three. Working capital at the end of year four will be nil.
- Tax rate is 30%.
- Ignore tax on capital gain.

Z Ltd. will not make any additional investment, if it yields less than 12% Advice, whether existing machine should be replaced or not.

Year	1	2	3	4	5
PVIF0.12, t	0.893	0.797	0.712	0.636	0.567

Solution

Working Notes:

(i) Calculation of Net Initial Cash Outflow

Particulars	**Rs.**
Cost of New Machine	12,00,000
Less: Sale proceeds of existing machine	2,00,000
Net Purchase Price	10,00,000
Paid in year 0	8,00,000
Paid in year 1	2,00,000

(ii) Calculation of Additional Depreciation

Year	**1**	**2**	**3**	**4**
	Rs.	Rs.	Rs.	Rs.
Opening WDV of machine	10,00,000	8,00,000	6,40,000	5,12,000
Depreciation on new machine @ 20%	2,00,000	1,60,000	1,28,000	1,02,400
Closing WDV	8,00,000	6,40,000	5,12,000	4,09,600
Depreciation on old machine (4,80,000/8)	60,000	60,000	60,000	60,000
Incremental depreciation	**1,40,000**	**1,00,000**	**68,000**	**42,400**

(iii) Calculation of Annual Profit before Depreciation and Tax (PBDT)

Particulars	**Incremental Values (Rs.)**
Sales	12,25,000
Contribution	6,12,500
Less: Indirect Cost	1,18,750
Profit before Depreciation and Tax (PBDT)	4,93,750

Calculation of Incremental NPV

Year	PVF @ 12%	PBTD(Rs.)	Incremental Depreciation (Rs.)	PBT(Rs.)	Tax @ 30%(Rs.)	Cash Inflows (Rs.)	PV of Cash Inflows (Rs.)
	(1)	(2)	(3)	(4)	(5) = (4) x 0.30	(6) = (4) – (5)+ (3)	(7) = (6) x (1)
1	0.893	4,93,750	1,40,000	3,53,750	106,125	3,87,625	3,46,149.125
2	0.797	4,93,750	1,00,000	3,93,750	1,18,125	3,75,625	2,99,373.125
3	0.712	4,93,750	68,000	4,25,750	1,27,725	3,66,025	2,60,609.800
4	0.636	4,93,750	42,400	4,51,350	1,35,405	3,58,345	2,27,907.420
*	*						11,34,039.470
Add: PV of Salvage (Rs. 1,00,000 x 0.636)							63,600
Less: Initial Cash Outflow - Year 0							8,00,000
Year 1 (Rs. 2,00,000 × 0.893)							1,78,600
Less: Working Capital - Year 0							2,50,000
Year 2 (Rs. 3,00,000 × 0.797)							2,39,100
Add: Working Capital released - Year 4 (Rs. 5,50,000 × 0.636)							3,49,800
Incremental Net Present Value							**79,739.470**

Since the incremental NPV is positive, existing machine should be replaced.

Alternative Presentation Computation of Outflow for new Machine:

	Rs.
Cost of new machine	12,00,000
Replaced cost of old machine	2,40,000
Cost of removal	40,000
Net Purchase price	10,00,000
Outflow at year 0	8,00,000
Outflow at year 1	2,00,000

Computation of additional deprecation

Year	1	2	3	4
	Rs.	Rs.	Rs.	Rs.
Opening WDV of machine	10,00,000	8,00,000	6,40,000	5,12,000
Depreciation on new machine @ 20%	2,00,000	1,60,000	1,28,000	1,02,400
Closing WDV	8,00,000	6,40,000	5,12,000	4,09,600
Depreciation on old machine (4,80,000/8)	60,000	60,000	60,000	60,000
Incremental depreciation	**1,40,000**	**1,00,000**	**68,000**	**42,400**

Computation of NPV

	Year	**0**	**1**	**2**	**3**	**4**
		Rs.	**Rs.**	**Rs.**	**Rs.**	**Rs.**
1.	Increase in sales revenue		12,25,000	12,25,000	12,25,000	12,25,000
2.	Contribution		6,12,500	6,12,500	6,12,500	6,12,500
3.	Increase in fixed cost		1,18,750	1,18,750	1,18,750	1,18,750
4.	Incremental Depreciation		1,40,000	1,00,000	68,000	42,400
5.	Net profit before tax [1-(2+3+4)]		3,53,750	3,93,750	4,25,750	4,51,350
6.	Net Profit after tax (5 x 70%)		2,47,625	2,75,625	2,98,025	3,15,945
7.	Add: Incremental					
	depreciation	1,40,000	1,00,000	68,000	42,400	
8.	Net Annual cash inflows (6 + 7)		3,87,625	3,75,625	3,66,025	3,58,345
9.	Release of salvage value					1,00,000
10.	(investment)/disinvestment in working capital	(2,50,000)		(3,00,000)		5,50,000
11.	Initial cost	(8,00,000)	(2,00,000)			
12.	Total net cash flows	(10,50,000)	1,87,625.0	75,625	3,66,025	10,08,345
13.	Discounting Factor	1	0.893	0.797	0.712	0.636
14.	Discounted cash flows (12 x 13)	(10,50,000)	1,67,549.125	60,273.125	2,60,609.800	641307.420

NPV = (1,67,549 + 60,273 + 2,60,610 + 6,41,307) - 10,50,000 = **Rs. 79,739**
Since the NPV is positive, existing machine should be replaced.

4. [4 Marks] A company has Rs. 1,00,000 available for investment and has identified the following four investments in which to invest.

Project	Investment (Rs.)	NPV (Rs.)
C	40,000	20,000
D	1,00,000	35,000
E	50,000	24,000
F	60,000	18,000

You are required to optimize the returns from a package of projects within the capital spending limit if-

(i) The projects are independent of each other and are divisible.

(ii) The projects are not divisible.

Solution

(i) Optimizing returns when projects are independent and divisible. Computation of NPVs per Re.1 of Investment and Ranking of the Projects

Project	Investment (₹)	NPV (₹)	NPV per Re. 1 Invested (₹)	Ranking
C	40,000	20,000	0.50	1
D	1,00,000	35,000	0.35	3
E	50,000	24,000	0.48	2
F	60,000	18,000	0.30	4

Building up of a Package of Projects based on their Rankings

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

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

(ii) Optimizing returns when projects are indivisible.

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

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

5. [5 Marks] XYZ Ltd. is presently all equity financed. The directors of the company have been evaluating investment in a project which will require Rs. 270 lakhs capital expenditure on new machinery. They expect the capital investment to provide annual cash flows of Rs. 42 lakhs indefinitely which is net of all tax adjustments. The discount rate which it applies to such investment decisions is 14% net.
The directors of the company believe that the current capital structure fails to take advantage of tax benefits of debt, and propose to finance the new project with undated perpetual debt secured on the company's assets. The company intends to issue sufficient debt to cover the cost of capital expenditure and the after tax cost of issue.
The current annual gross rate of interest required by the market on corporate undated debt of similar risk is 10%. The after tax costs of issue are expected to be Rs. 10 lakhs. Company's tax rate is 30%.
You are required to calculate:
(i) The adjusted present value of the investment,
(ii) The adjusted discount rate and
Explain the circumstances under which this adjusted discount rate may be used to evaluate future investments.

Solution

(i) Calculation of Adjusted Present Value of Investment (APV)

Adjusted PV = Base Case PV + PV of financing decisions associated with the project
Base Case NPV for the project:
(-) Rs. 270 lakhs + (Rs. 42 lakhs / 0.14) = (-) Rs. 270 lakhs + Rs. 300 lakhs
= Rs. 30
Issue costs = Rs. 10 lakhs
Thus, the amount to be raised = Rs. 270 lakhs + Rs. 10 lakhs
= Rs. 280 lakhs
Annual tax relief on interest payment = Rs. 280 X 0.1 X 0.3
= Rs. 8.4 lakhs in perpetuity
The value of tax relief in perpetuity = Rs. 8.4 lakhs / 0.1
= Rs. 84 lakhs
Therefore, APV = Base case PV – Issue Costs + PV of Tax Relief on debt interest
= Rs. 30 lakhs – Rs. 10 lakhs + 84 lakhs = Rs. 104 lakhs

(ii) Calculation of Adjusted Discount Rate (ADR)

Annual Income / Savings required to allow an NPV to zero
Let the annual income be x.
(-) Rs.280 lakhs X (Annual Income / 0.14) = (-) Rs.104 lakhs
Annual Income / 0.14 = (-) Rs. 104 + Rs. 280 lakhs
Therefore, Annual income = Rs. 176 X 0.14 = Rs. 24.64 lakhs
Adjusted discount rate = (Rs. 24.64 lakhs / Rs.280 lakhs) X 100
= 8.8%

(iii) Useable circumstances

This ADR may be used to evaluate future investments only if the business risk of the new venture is identical to the one being evaluated here and the project is to be financed by the same method on the same terms. The effect on the company's cost of capital of introducing debt into the capital structure cannot be ignored.