

CAPITAL BUDGETING

Problem No.1

A Company is considering the replacement of its existing Machine which is obsolete and unable to meet the rapidly rising demand for its Product. The Company is faced with two alternatives: to buy Machine X which is similar to the Existing Machine or to go in for Machine Y which is more expensive and has much greater capacity. The Cash Flows at the Present level of operation is under the two alternatives are as under:

Particulars	Machine x Rs.	Machine Y Rs.
Cost of Machine	5,00,000	8,00,000
Cash flow (years):		
1	--	2,00,000
2	1,00,000	2,80,000
3	4,00,000	3,20,000
4	2,80,000	3,40,000
5	2,80,000	3,00,000

The Company's Cost of Capital is 10%.

The finance manager tries to appraise the Machine by calculating the following:

(1) Net Present Value; (2) Profitability Index; (3) Pay back Period; (4) Discounted Pay back Period.

Note: Present Values of Re. 1 at 10% discount rate are as follows:-

Years	0	1	2	3	4	5
P.V	1.00	0.91	0.83	0.75	0.68	0.62

Answer

Machine X

Yr	CIFs	PVF @ 10%	PVCFs	Cum CFs	Cum PVCFs
1	-	0.91	-	-	-
2	1,00,000	0.83	83,000	1,00,000	83,000
3	4,00,000	0.75	3,00,000	5,00,000	3,83,000
4	2,80,000	0.68	1,90,400	7,80,000	5,73,400
5	2,80,000	0.62	1,73,600	10,60,000	7,47,000
	PVCIFs		7,47,000		
	- PVCOFs		5,00,000		
	NPV		2,47,000		

$$PI = \frac{PV \text{ of CIFs}}{PV \text{ of COFs}} = \frac{7,47,000}{5,00,000} = 1.494$$

Payback period = 3 yrs

$$\begin{aligned} \text{Discounted payback period} &= 3\text{yrs} + \frac{360}{1,90,400} * 1,17,000 \\ &= 3\text{yrs} + 221 \text{ days} \\ &= 3 \text{ yrs} + 7 \text{ mths} + 11 \text{ days} \end{aligned}$$

Machine Y

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Yr	CIFs	Cum CFs	PVF @ 10%	PVCFs	Cum PVCFs
1	2,00,000	2,00,000	0.91	1,82,000	1,82,000
2	2,80,000	4,80,000	0.83	2,32,400	4,14,400
3	3,20,000	8,00,000	0.75	2,40,000	6,54,400
4	3,40,000	11,40,000	0.68	2,31,200	8,85,600
5	3,00,000	14,40,000	0.62	1,86,000	10,71,600
PVCIFs				10,71,600	
- PVCOFs				8,00,000	
NPV				2,71,600	
PI = $\frac{\text{PV of CIFs}}{\text{PV of COFs}}$				$= \frac{10,71,600}{8,00,000}$	
				$= 1.3395$	

Payback period = 3 yrs

$$\begin{aligned} \text{Discounted payback period} &= 3\text{yrs} + \frac{360}{2,31,200} * 1,45,600 \\ &= 3\text{yrs} + 222 \text{ days} \\ &= 3 \text{ yrs} + 7 \text{ mths} + 17 \text{ days} \end{aligned}$$

Problem No.2

Surya Ltd. is purchase a machine. Two proposal are available, each costing Rs. 10,00,000. In comparing the profitability of the machines, a discounting rate of 10% is to be used and machine is to be written off in five years by straight line method of depreciation with nil residual value. **Cash inflows after tax** are expected as follows:

Years	Proposal I Rs.	Proposal II Rs.
1	3,20,000	1,05,000
2	4,05,000	3,00,000
3	5,10,000	4,10,000
4	3,00,000	5,90,000
5	2,00,000	4,00,000

Indicate which machine would be profitable using the following methods of ranking investment proposal.

1. Payback method
2. Net present value method
3. Profitability Index Method
4. Average Rate of Return Method

Answer

Proposal I

Yr	CIFs	Cum CFs	PVF @ 10%	PVCFs	Cum PVCFs
1	3,20,000	3,20,000	0.909	2,90,880	2,90,880
2	4,05,000	7,25,000	0.826	3,34,530	6,25,410
3	5,10,000	12,35,000	0.751	3,83,010	10,08,420
4	3,00,000	15,35,000	0.683	2,04,900	12,13,320
5	2,00,000	17,35,000	0.621	1,24,200	13,37,520

$$\text{Payback method} = 2 + \frac{360}{2,75,000}$$

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$$\begin{aligned}
 & 5,10,000 \\
 & = 2 + 194 \text{ days} \\
 & = 2 \text{ years} + 6 \text{ months} + 14 \text{ days}
 \end{aligned}$$

$$\text{NPV} = \text{PVCIFs} - \text{PVCOFs} = 13,37,520 - 10,00,000 = 3,37,520$$

$$\begin{aligned}
 \text{PI} &= \frac{\text{PV of CIFs}}{\text{PV of COFs}} = \frac{13,37,520}{10,00,000} \\
 &= 1.34
 \end{aligned}$$

Proposal II

Yr	CIFs	Cum CFs	PVF @ 10%	PVCFs	Cum PVCFs
1	1,05,000	1,05,000	0.909	95,445	95,445
2	3,00,000	4,05,000	0.826	2,47,800	3,43,245
3	4,10,000	8,15,000	0.751	3,07,910	6,51,155
4	5,90,000	14,05,000	0.683	4,02,970	10,54,125
5	4,00,000	18,05,000	0.621	2,48,400	13,02,525

$$\begin{aligned}
 \text{Payback method} &= 3 + \frac{360}{5,90,000} * 1,85,000 \\
 &= 3 + 113 \text{ days} \\
 &= 3 \text{ yrs} + 3 \text{ mths} + 23 \text{ days}
 \end{aligned}$$

$$\text{NPV} = \text{PVCIFs} - \text{PVCOFs} = 13,02,525 - 10,00,000 = 3,02,525$$

$$\begin{aligned}
 \text{PI} &= \frac{\text{PV of CIFs}}{\text{PV of COFs}} = \frac{13,02,525}{10,00,000} \\
 &= 1.3
 \end{aligned}$$

Calculation of IRR

Proposal I

Yr	CIFs	PVF @ 29%	PVCIFs	PVF @ 23%	PVCIFs	PVF @ 24%	PVCIFs
1	3,20,000	0.775	248000	0.813	2,60,160	0.806	2,57,920
2	4,05,000	0.601	243405	0.66	2,67,300	0.65	2,63,250
3	5,10,000	0.466	237660	0.537	2,73,870	0.524	2,67,240
4	3,00,000	0.361	108300	0.437	1,31,100	0.423	1,26,900
5	2,00,000	0.280	56000	0.355	71,000	0.341	68,200
			8,93,365		10,03,430		9,83,510

$$\begin{aligned}
 \text{IRR} &= 23\% + \frac{1}{19,920} * 3,430 \\
 &= 23.17\%
 \end{aligned}$$

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Proposal II

Yr	CIFs	PVF @ 18%	PVCIFs	PVF @ 19%	PVCIFs	PVF @ 20%	PVCIFs
1	1,05,000	0.847	88935	0.84	88,200	0.833	87,465
2	3,00,000	0.718	215400	0.706	2,11,800	0.694	2,08,200
3	4,10,000	0.609	249690	0.593	2,43,130	0.579	2,37,390
4	5,90,000	0.516	304440	0.499	2,94,410	0.482	2,84,380
5	4,00,000	0.437	174800	0.419	1,67,600	0.402	1,60,800
			10,33,265		10,05,140		9,78,235

$$\text{IRR} = 19\% + \frac{1}{26,905} * 5,140$$

$$= 19.19\%$$

Problem No.3

A company is considering an investment proposal to install new milling controls. The project will cost Rs. 50,000. The facility has a life expectancy of 5 years and no salvage value. The company tax rate is 55%. The firm uses straight line depreciation. The estimated profit before Dep. from the proposed investment proposal are as follows:

Year	Profit Rs.
1	10,000
2	11,000
3	14,000
4	15,000
5	25,000

Compute the following:

- Payback period.
- Average rate of return.
- Internal rate of return.
- Net present value at 10% discount rate.
- Profitability index at 10% discount rate.

Answer

Calculation of cash flows:

Particulars	1	2	3	4	5
PBDT	10,000	11,000	14,000	15,000	25,000
- Dep	10,000	10,000	10,000	10,000	10,000
PBT	-	1,000	4,000	5,000	15,000
- tax @ 55%	-	550	2,200	2,750	8,250
PAT	-	450	1,800	2,250	6,750
+ dep	10,000	10,000	10,000	10,000	10,000
CIFs	10,000	10,450	11,800	12,250	16,750

Yr	CIFs	PVF @ 10%	PVCIFs
1	10,000	0.909	9090
2	10,450	0.826	8631.7
3	11,800	0.751	8861.8
4	12,250	0.683	8366.75

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$$5 \quad 16,750 \quad 0.621 \quad \frac{10401.75}{45,352}$$

$$\begin{aligned} \text{Payback period} &= 4 + \frac{360}{16,750} * 5,500 \\ &= 4 + 118 \text{ days} \\ &= \mathbf{4 \text{ yrs} + 3\text{mths} + 28 \text{ days}} \end{aligned}$$

$$\text{NPV} = \text{PVCIFs} - \text{PVCOFs} = 45,352 - 50,000 = \mathbf{-4,648}$$

$$\text{ARR} = \frac{\text{Avg net profit}}{\text{Avg investment}}$$

Avg. net profit = 2,250

Avg investment = (50,000 + 0)/2 = 25,000

$$\text{ARR} = \frac{2,250}{25,000} * 100 = \mathbf{9\%}$$

$$\begin{aligned} \text{PI} &= \frac{\text{PV of CIFs}}{\text{PV of COFs}} = \frac{45,352}{50,000} \\ &= \mathbf{0.907} \end{aligned}$$

Yr	CIFs	PVF @ 6%	PVCIFs	PVF @ 7%	PVCIFs
1	10,000	0.943	9,430	0.935	9,350
2	10,450	0.890	9,300	0.873	9,123
3	11,800	0.840	9,912	0.816	9,629
4	12,250	0.792	9,702	0.763	9,347
5	16,750	0.747	12,512	0.713	11,943
			50,857		49,391

Difference for 1% i.e., 6% to 7%
= 50,856.75 - 49,391.15 = 1,465.6

Required variance is 856.75

Therefore,

$$\begin{aligned} &6\% + \frac{1}{1,465.60} * 856.75 \\ &= \mathbf{6.58\%} \end{aligned}$$

Problem No.4

A company is considering the replacement of its existing machine which is obsolete and unable to meet the rapidly rising demand for its product. The company is faced with two alternatives: (i) to buy Machine A which is similar to the existing machine or (ii) to go in for Machine B which is more expensive and has much greater capacity. The cash flows at the present level of operations under the two alternatives are as follows:

Cash flows (in lacs of Rs.) at the end of year:

Particulars	0	1	2	3	4	5
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Machine A	25	--	5	20	14	14
Machine B	40	10	14	16	17	15

The company's cost of capital is 10%. The finance manager tries to evaluate the machines by calculating the following:

(1) NPV (2) Profitability Index; (3) Payback period; and (4) Discounted pay back period;

At the end of the calculations, however, the finance manager is unable to make up his mind as to which machine to recommend.

You are required to make these calculation and in the light thereof to advise the finance manager about the proposed investment.

Answer

Machine A

Yr	CIFs	Cum CFs	PVF @ 10%	PVCFs	Cum PVCFs
1	-	-	0.909	-	-
2	5,00,000	5,00,000	0.826	4,13,000	4,13,000
3	20,00,000	25,00,000	0.751	15,02,000	19,15,000
4	14,00,000	39,00,000	0.683	9,56,200	28,71,200
5	14,00,000	53,00,000	0.621	8,69,400	37,40,600
				PVCIFs	37,40,600
				- PVCOFs	25,00,000
				NPV	12,40,600

$$PI = \frac{PV \text{ of CIFs}}{PV \text{ of COFs}} = \frac{37,40,600}{25,00,000} = 1.496$$

Payback period = 3 yrs

$$\begin{aligned} \text{Discounted payback period} &= 3\text{yrs} + \frac{360}{9,56,200} * 5,85,000 \\ &= 3\text{yrs} + 220 \text{ days} \\ &= \mathbf{3 \text{ yrs} + 7\text{mths} + 10 \text{ days}} \end{aligned}$$

Machine B

Yr	CIFs	Cum CFs	PVF @ 10%	PVCFs	Cum PVCFs
1	10,00,000	10,00,000	0.909	9,09,000	9,09,000
2	14,00,000	24,00,000	0.826	11,56,400	20,65,400
3	16,00,000	40,00,000	0.751	12,01,600	32,67,000
4	17,00,000	57,00,000	0.683	11,61,100	44,28,100
5	15,00,000	72,00,000	0.621	9,31,500	53,59,600
				PVCIFs	53,59,600
				- PVCOFs	40,00,000
				NPV	13,59,600

$$PI = \frac{PV \text{ of CIFs}}{PV \text{ of COFs}} = \frac{53,59,600}{40,00,000}$$

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$$= 1.340$$

Payback period = 3 yrs

$$\begin{aligned} \text{Discounted payback period} &= 3\text{yrs} + \frac{360}{11,61,100} * 7,33,000 \\ &= 3\text{yrs} + 227 \text{ days} \\ &= \mathbf{3 \text{ yrs} + 7\text{mths} + 17 \text{ days}} \end{aligned}$$

Problem No.5

A Company has to make a choice between projects namely A and B. The initial capital outlay of two project are Rs. 135000 and 240000 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:

Years	Project A Rs.	Project B Rs.	Project C Rs.
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 of the project:

(i) Discounted Payback Period (ii) Profitability Index (iii) NPV

Answer

Project A

Yr	CIFs	Cum CFs	PVF @ 16%	PVCFs	Cum PVCFs
1	-	-	0.862	-	-
2	30,000	30,000	0.743	22,290	22,290
3	1,32,000	1,62,000	0.641	84,612	1,06,902
4	84,000	2,46,000	0.552	46,368	1,53,270
5	84,000	3,30,000	0.476	39,984	1,93,254
			PVCIFs	1,93,254	
			- PVCOFs	1,35,000	
			NPV	58,254	

$$\begin{aligned} \text{PI} &= \frac{\text{PV of CIFs}}{\text{PV of COFs}} = \frac{1,93,254}{1,35,000} \\ &= \mathbf{1.432} \end{aligned}$$

Payback period = 2 yrs + 9 months + 16 days

$$\begin{aligned} \text{Discounted payback period} &= 3\text{yrs} + \frac{360}{46,368} * 28,098 \\ &= 3\text{yrs} + 218 \text{ days} \\ &= \mathbf{3 \text{ yrs} + 7\text{mths} + 8 \text{ days}} \end{aligned}$$

Project B

Yr	CIFs	Cum CFs	PVF @ 16%	PVCFs	Cum PVCFs
1	60,000	60,000	0.862	51,720	51,720
2	84,000	1,44,000	0.743	62,412	1,14,132

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3	96,000	2,40,000	0.641	61,536	1,75,668
4	1,02,000	3,42,000	0.552	56,304	2,31,972
5	90,000	4,32,000	0.476	42,840	2,74,812
			PVCIFs	2,74,812	
			- PVCOFs	2,40,000	
			NPV	34,812	

$$PI = \frac{PV \text{ of CIFs}}{PV \text{ of COFs}} = \frac{2,74,812}{2,40,000} = 1.145$$

Payback period = 4 yrs

$$\begin{aligned} \text{Discounted payback period} &= 4 \text{ yrs} + \frac{360}{42,840} * 8,028 \\ &= 4 \text{ yrs} + 67 \text{ days} \\ &= \mathbf{4 \text{ yrs} + 2\text{mths} + 7 \text{ days}} \end{aligned}$$

Problem No.6

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

Years	Earning (in Rs 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 year 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.

Answer

Calculation of depreciation:

Cost of asset	4,00,00,000			
- dep @ 20% I	80,00,000			
		3,20,00,000		
- dep @ 20% II	64,00,000			
		2,56,00,000		
- dep @ 20% III	51,20,000			
		2,04,80,000		
- dep @ 20% IV	40,96,000			
		1,63,84,000		
- dep @ 20% V	32,76,800			
		1,31,07,200		

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Particulars	1	2	3	4	5
PBDT/Earnings	1,60,00,000	1,60,00,000	1,80,00,000	1,80,00,000	1,50,00,000
- Dep	80,00,000	64,00,000	51,20,000	40,96,000	1,63,84,000*
PBT	80,00,000	96,00,000	1,28,80,000	1,39,04,000	-13,84,000
- tax @ 50%	40,00,000	48,00,000	64,40,000	69,52,000	+6,92,000
PAT	40,00,000	48,00,000	64,40,000	69,52,000	-6,92,000
+ dep	80,00,000	64,00,000	51,20,000	40,96,000	*1,63,84,000
CIFs	1,20,00,000	1,12,00,000	1,15,60,000	1,10,48,000	1,56,92,000
PVF @ 12%	0.893	0.797	0.712	0.636	0.567
PVCIFs	1,07,14,286	89,28,571	82,28,180	70,21,204	88,97,364

*This amount includes depreciation for last year (₹32,76,800) + Short term capital loss (1,31,07,200);

Asset's residual value is Nil – it means the remaining WDV at the end of the life is considered as capital loss (as per Income tax Act) and that gets the entity tax benefit. Hence it should also be considered.

IRR lies between 15 & 16%

Therefore, NPV = 4,00,77,614 - 4,00,00,000 = 77,614

$$\text{IRR} = 14 + \frac{16.07 * 2}{19.93}$$

$$= 15.61\%$$

Problem No. 7

C Ltd. is considering investing in a project. The expected original investment in the project will be Rs. 2,00,000, the life of the project will be 5 years with no salvage value. The expected PBT during the life of the project will be as follows:

Year	1	2	3	4	5
Rs.	85,000	1,00,000	80,000	80,000	40,000

The project will be depreciated at the rate of 20% on original cost. The company is subject to 30% tax rate:

Required:

- (i) Calculate payback period and average rate of return
- (ii) Calculate NPV and NPV Index if cost of capital is 10%
- (iii) Calculate internal rate of return

Answer

Calculation of CIFs

Particulars	1	2	3	4	5
PABDT	85,000	1,00,000	80,000	80,000	40,000
- tax @ 30%	25,500	30,000	24,000	24,000	12,000
PAT	59,500	70,000	56,000	56,000	28,000
+ dep (2,00,000 * 20%)	40,000	40,000	40,000	40,000	40,000
CIFs	99,500	1,10,000	96,000	96,000	68,000

$$\text{Avg net profit} = \frac{2,69,500}{5} = 53,900$$

$$\text{Avg investment} = \frac{2,00,000 + 0}{5} = 40,000$$

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Project A

Yr	CIFs	Cum CFs	PVF @ 10%	PVCFs	Cum PVCFs
1	99,500	99,500	0.909	90,455	90,455
2	1,10,000	2,09,500	0.826	90,909	1,81,364
3	96,000	3,05,500	0.751	72,126	2,53,490
4	96,000	4,01,500	0.683	65,569	3,19,059
5	68,000	4,69,500	0.621	42,223	3,61,282
				PVCIFs	3,61,282
				- PVCOFs	2,00,000
				NPV	1,61,282

$$PI = \frac{PV \text{ of CIFs}}{PV \text{ of COFs}} = \frac{3,61,282}{2,00,000} = 1.806$$

Payback period = 2 yrs

$$\begin{aligned} \text{Discounted payback period} &= 1\text{yrs} + \frac{360}{1,10,000} * 1,00,500 \\ &= 1\text{yrs} + 329 \text{ days} \\ &= 1 \text{ yr} + 10 \text{ mths} + 29 \text{ days} \end{aligned}$$

$$\begin{aligned} ARR &= \frac{\text{Avg net profit}}{\text{Avg investment}} * 100 \\ &= \frac{53,900}{1,00,000} * 100 \\ &= 53.9\% \end{aligned}$$

CIFs	PVF @ 39%	PVCIFs	PVF @ 40%	PVCIFs
99,500	0.719	71,583	0.714	71,071
1,10,000	0.518	56,933	0.510	56,122
96,000	0.372	35,746	0.364	34,985
96,000	0.268	25,717	0.260	24,990
68,000	0.193	13,105	0.186	12,644
		2,03,083	1,99,812	

$$\begin{aligned} IRR &= 39 + \frac{1}{3389.5} * 3084.5 \\ &= 39.91\% \end{aligned}$$

Problem No. 8

PR Engineering Ltd. is considering the purchase of a new machine which will carry out some operations which are at present performed by manual labour. The following information related to the two alternative model - 'MX' and 'MY' are available:

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Particulars	Machine MX	Machine MY
Cost of Machine	Rs. 8,00,000	Rs. 10,20,000
Expected Life	6 years	6 years
Scrap value	Rs. 20,000	Rs. 30,000

Estimated net income before depreciation and tax:

Year	Rs.	Rs.
1	2,50,000	2,70,000
2	2,30,000	3,60,000
3	1,80,000	3,80,000
4	2,00,000	2,80,000
5	1,80,000	2,60,000
6	1,60,000	1,85,000

Corporate tax rate for this company is 30 percent and Company required rate of return on investment proposal is 10 percent. Depreciation will be charged on straight line basis.

You are required to:

- (i) Calculate the pay back of each proposal.
- (ii) Calculate the net present value of each proposal.
- (iii) Which proposal you would recommend and why?

Answer

Working Notes:

1. Annual Depreciation of machines

$$\text{Depreciation of Machine 'MX'} = \frac{\text{Rs. } 8,00,000 - \text{Rs. } 20,000}{6} = \text{Rs. } 1,30,000$$

$$\text{Depreciation of Machine 'MY'} = \frac{\text{Rs. } 10,20,000 - \text{Rs. } 30,000}{6} = \text{Rs. } 1,65,000$$

1. Calculation of Cash inflows:

Machine 'MX'	Years					
	1	2	3	4	5	6
Income before dep & Tax	2,50,000	2,30,000	1,80,000	2,00,000	1,80,000	1,60,000
Less: Depreciation	1,30,000	1,30,000	1,30,000	1,30,000	1,30,000	1,30,000
PBT	1,20,000	1,00,000	50,000	70,000	50,000	30,000
Less: Tax @ 30%	36,000	30,000	15,000	21,000	15,000	9,000
PAT	84,000	70,000	35,000	49,000	35,000	21,000
Add: Depreciation	1,30,000	1,30,000	1,30,000	1,30,000	1,30,000	1,30,000
Cash inflows	2,14,000	2,00,000	1,65,000	1,79,000	1,65,000	1,51,000

Machine 'MY'	Years					
	1	2	3	4	5	6
Income before dep & Tax	2,70,000	3,60,000	3,80,000	2,80,000	2,60,000	1,85,000
Less: Depreciation	1,65,000	1,65,000	1,65,000	1,65,000	1,65,000	1,65,000
PBT	1,05,000	1,95,000	2,15,000	1,15,000	95,000	20,000

CAPITAL BUDGETING

Less: Tax @ 30%	31,500	58,500	64,500	34,500	28,500	6,000
PAT	73,500	1,36,500	1,50,500	80,500	66,500	14,000
Add: Depreciation	1,65,000	1,65,000	1,65,000	1,65,000	1,65,000	1,65,000
Cash inflows	2,38,500	3,01,500	3,15,500	2,45,500	2,31,500	1,79,000

i. Calculation of Pay-back period:

Cumulative Cash Inflows:

	Years					
	1	2	3	4	5	6
Machine 'MX'	2,14,000	4,14,000	5,79,000	7,58,000	9,23,000	10,74,000
Machine 'MY'	2,38,500	5,40,000	8,55,500	11,01,000	13,32,500	15,11,500

Payback period of "MX"

$$= 4 + \frac{(8,00,000 - 7,58,000)}{1,65,000}$$

= 4.25 years or 4 years and 3 mths

Payback period of "MY"

$$= 3 + \frac{(10,20,000 - 8,55,500)}{2,45,500}$$

= 3 + 0.67 = 3.67 years

Or, 3 years and 8 mths

CAPITAL BUDGETING

ii. Calculation of Net Present Value:

		Machine 'MX'		Machine 'MY'	
Year	PV Factor	Cash Inflows Rs.	Present Value Rs.	Cash inflows Rs.	Present Value Rs.
0	1	-8,00,000	-8,00,000	-10,20,000	-10,20,000
1	0.909	2,14,000	1,94,526	2,38,500	2,16,797
2	0.826	2,00,000	1,65,200	3,01,500	2,49,039
3	0.751	1,65,000	1,23,915	3,15,500	2,36,941
4	0.683	1,79,000	1,22,257	2,45,500	1,67,677
5	0.621	1,65,000	1,02,465	2,31,500	1,43,762
6	0.564	1,51,000	85,164	1,79,000	1,00,956
Scrap Value	0.564	20,000	11,280	30,000	16,920
Net Present Value			4,807		1,12,092

iii. Recommendation:

	Machine 'MX'	Machine 'MY'
Ranking according to Pay-back period	II	I
Ranking according to NPV	II	I

Problem No. 9

XYZ Ltd. is planning to introduce a new product with a project life of 8 years. The project is to be set up in Special Economic Zone (SEZ) qualifies for onetime (at starting) tax free subsidy from the state Government of Rs. 25,00,000 on capital investment. Initial equipment cost will be Rs. 1.75 crore. Additional equipment cost Rs. 12,50,000 will be purchased at the end of the third year from the cash inflow of this year. At the end of the 8 years, the original equipment will have no resale value, but additional equipment can be sold for Rs. 1,25,000. A working capital of Rs. 20,00,000 will be needed and it will be released at the end of the eighth year. The project will be financed with sufficient amount of equity capital.

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

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

A sale price of Rs. 120 per unit is expected and variable expenses will amount to 60% of sales revenue. Fixed cash operating cost will amount Rs. 18,00,000 per year. The loss of any year will be set off from the profit of subsequent two year. The company is subject to 30% tax rate and considered 12% to be an appropriate after tax cost of capital for this project. The company follows straight line method of depreciation.

Required:

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

Answer

Calculation of COFs

Equipment cost	1,75,00,000	
+ Additional cost	8,90,000	(12,50,000 * 0.712)
+ Working capital	20,00,000	

CAPITAL BUDGETING

	2,03,90,000
- subsidy	25,00,000
COFs	1,78,90,000

Terminal value

Working capital	20,00,000
Salvage value	1,25,000
	21,25,000

Calculation of depreciation

= 175,00,000/8 = 21,87,500 for 3yrs
 = (12,50,000 - 1,25,000)/5 = 2,25,000 + 21,87,500
 = 24,12,500 for next 5 yrs

Calculation of CIFs

Yr	Sales	VC @ 60%		FC	PBDT	Dep
1	86,40,000	51,84,000	34,56,000	18,00,000	16,56,000	21,87,500
2	1,29,60,000	77,76,000	51,84,000	18,00,000	33,84,000	21,87,500
3	3,12,00,000	1,87,20,000	1,24,80,000	18,00,000	1,06,80,000	21,87,500
4 to 5	3,24,00,000	1,94,40,000	1,29,60,000	18,00,000	1,11,60,000	24,12,500
6 to 8	2,16,00,000	1,29,60,000	86,40,000	18,00,000	68,40,000	24,12,500

PBT	Tax @ 30%	PAT + Dep	PVF @ 12%	PVCIFs
-5,31,500	-	16,56,000	0.893	14,78,571
11,96,500	1,99,500	31,84,500	0.797	25,38,664
84,92,500	25,47,750	81,32,250	0.712	57,88,375
87,47,500	26,24,250	85,35,750	1.203	1,02,68,507
44,27,500	13,28,250	55,11,750	1.363	75,12,515
	T.V	21,25,000	0.404	8,58,500

= 2,84,46,539 - 178,90,000

NPV = 1,05,56,539

The company should select the project

Problem No. 10

National Bottling Company is contemplating to replace one of its bottling machines with a new and more efficient machine. The old machine has a cost value of Rs. 10 lakhs and a useful life of ten years. The machine was bought five year back. The company does not expect to realise any return from scrapping the old machine at the end of ten years but presently if it is sold to another company in the industry, National Bottling Company would receive Rs. 6 lakhs for it. The new machine has a purchase price of Rs. 20 lakhs. It has an estimated salvage value of Rs. 2 lakhs and has useful life of five years. The new machine will have a greater capacity and annual sales are expected to increase from Rs. 10 lakhs to Rs. 12 lakhs. Operating efficiencies with the new machine will also produce savings of Rs. 2 lakhs a year. Depreciation is on a straight-line basis over five year life.

CAPITAL BUDGETING

The cost of capital is 8% and a 50% tax-rate is applicable. The present value interest factor for an annuity for five years, at 8% is 3.993 and present value interest factor at the end of five years is 0.681. Capital gain is taxable. Should the company replace the old machine?

Answer

Cost of the machine = 20,00,000
 - salvage value of old machine = 6,00,000

Book value of old machine = 5,00,000
 - selling price 6,00,000
 capital profit 1,00,000

add: capital profit * tax
 1,00,000 * 50% 50,000
 Cash outflows 14,50,000

Incremental savings

current sales 12,00,000
 - old sales 10,00,000
 2,00,000
 operating sales 2,00,000
 incremental PBDT 4,00,000

Incremental depreciation

Dep on old machine (5,00,000/5) 1,00,000
 Dep on new machine
 (20,00,000 - 2,00,000)/5 3,60,000
 Incremental dep 2,60,000

Calculation of cash inflows:

Year	PBDT	Dep	PBT	Tax @ 50%	PAT	Dep	CIFs
1 to 5	4,00,000	2,60,000	1,40,000	70,000	70,000	2,60,000	3,30,000
	3,30,000 * 3.993 =	13,17,690					
	2,00,000 * 0.681	1,36,200					
		14,53,890					
		14,50,000					
NPV		3,890					

Problem No. 11

A company has a machine which has been in operations for 2 years; its remaining estimated useful is 10 years with no salvage value at the end. Its current market value is Rs. 1,00,000. The management is considering a proposal to purchase as improved model of a machine, which gives increased output. The relevant particulars are as follows:

Particulars	Existing Machine	New Machine
Purchaser Price	Rs. 2,40,000	Rs. 4,00,000

CAPITAL BUDGETING

Estimated life	12 year	10 year
Salvage value	--	--
Annual operating hours	2,000	2,000
Selling price per unit	Rs. 10	Rs. 10
Output per hour	15 units	30 units
Material cost per unit	Rs. 2	Rs. 2
Labour cost per hour	Rs. 20	Rs. 40
Consumable stores per year	2,000	5,000
Repairs and maintenance per year	9,000	6,000
Working capital	25,000	40,000

The company follows the straight-line method of depreciation and is subject to 50% tax should the existing machine be replaced? Assume that the company's required rate of return is 15% and that the loss on sale of assets is tax deductible.

Answer

Cost of the machine =		4,00,000	
- salvage value of old machine =		<u>1,00,000</u>	
			3,00,000
Cost of old machine	2,00,000		
- selling price	<u>1,00,000</u>		
capital loss	-1,00,000		
tax @ 50%	<u>50,000</u>		
1,00,000 * 50%	-50,000		-50,000
			<u>2,50,000</u>
add: additional WC (40,000 - 25,000)			<u>15,000</u>
Incremental cash outflows at Y0			<u>2,65,000</u>

Calculation of incremental profits

Particulars	Old machine	New machine
Units	30,000	60,000
	(2,000 * 15)	(2,000 * 30)
Sales	3,00,000	6,00,000
- Material cost	-60,000	-1,20,000
- Labour cost	-40,000	-80,000
- consumable stores	-2,000	-5,000
- Repairs	<u>-9,000</u>	<u>-6,000</u>
Profit	<u>1,89,000</u>	<u>3,89,000</u>

Incremental profit before dep = 2,00,000

Calculation of additional dep

Old machine dep	(2,40,000/12)	20,000
New machine dep	(4,00,000/10)	<u>40,000</u>
incremental dep		<u>20,000</u>

CAPITAL BUDGETING

T.V

Old asset W.C	25,000
New asset W.C	40,000
Incremental W.C	15,000

Incremental profit before dep

		dep	tax		dep		
1 to 10	2,00,000	20,000	1,80,000	90,000	90,000	20,000	1,10,000
1 to 10	1,10,000 * 5.019 =		5,52,090				
10	15,000 * 0.247 =		3,705				
			5,55,795				
		- ICOF	2,65,000				
		NPV	2,90,795				

Machine should be replaced

Problem No. 12

A company is required to choose between two machines A and B. The two machine are designed differently, out have identical capacity and do exactly the same job. Machine A cost Rs. 6,00,000 and will last for 3 years. It cost Rs. 1,20,000 per year to run.

Machine B is an economy model costing Rs. 4,00,000 but will last only for two years, and cost Rs. 1,80,000 per year to run. These are real cash flows. The cost are forecasted in Rupees of constant purchasing power. Opportunity cost of capital is 10%. Which machine company should buy? Ignore tax

Answer

Machine A Cost p.a.

Equated cost (6,00,000/2.487)	2,41,268
+ co-running cost p.a.	1,20,000
cost p.a.	3,61,268

Machine B Cost p.a.

Equated cost (4,00,000/1.736)	2,30,476
+ co-running cost p.a	1,80,000
cost p.a	4,10,476

Machine A should be selected as per annum cost is lower

Problem No. 13

Samreen Enterprises has been operating its manufacturing facilities till 31.3.2017 on a single shift working with the following cost structure:

	Per unit (₹)
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CAPITAL BUDGETING

Cost of Materials	6.00
Wages (out of which 40% fixed)	5.00
Overheads (out of which 80% fixed)	5.00
Profit	<u>2.00</u>
Selling Price	<u>18.00</u>
Sales during 2016-17 – ₹ 4,32,000.	

As at 31.3.2017 the company held:

	(₹)
Stock of raw materials (at cost)	36,000
Work-in-progress (valued at prime cost)	22,000
Finished goods (valued at total cost)	72,000
Sundry debtors	1,08,000

In view of increased market demand, it is proposed to double production by working an extra shift. It is expected that a 10% discount will be available from suppliers of raw materials in view of increased volume of business. Selling price will remain the same. The credit period allowed to customers will remain unaltered. Credit availed of from suppliers will continue to remain at the present level i.e., 2 months. Lag in payment of wages and expenses will continue to remain half a month.

You are required to PREPARE the additional working capital requirements, if the policy to increase output is implemented.

Answer

This question can be solved using two approaches:

- (i) To assess the impact of double shift for long term as a matter of production policy.
- (ii) To assess the impact of double shift to mitigate the immediate demand for next year only.

The first approach is more appropriate and fulfilling the requirement of the question.

Workings:

- (1) Statement of cost at single shift and double shift working

	24,000 units		48,000 Units	
	Per unit (₹)	Total (₹)	Per unit (₹)	Total (₹)
Raw materials	6.00	1,44,000	5.40	2,59,200
Wages - Variable	3.00	72,000	3.00	1,44,000
Fixed	2.00	48,000	1.00	48,000
Overheads - Variable	1.00	24,000	1.00	48,000
Fixed	4.00	96,000	2.00	96,000
Total cost	16.00	3,84,000	12.40	5,95,200
Profit	2.00	48,000	5.60	2,68,800
	18.00	4,32,000	18.00	8,64,000

- (2) Sales in units 2016-17 = Sales / Selling price p.u. = 4,32,000 / 18 = 24,000 units
- (3) Stock of Raw Materials in units on 31.3.2017 = Value of stock / Cost p.u. = 36,000 / 6 = 6,000 units

CAPITAL BUDGETING

- (4) Stock of work-in-progress in units on 31.3.2017 = Value of WIP / Prime cost p.u. = 22,000 / (6+5) = 2,000 units;
- (5) Stock of finished goods in units 2016-17 = Value of stock / Total cost p.u. = 72,000 / 16 = 4,500 units

**Assessment of impact of double shift for long term as a matter of production policy:
Comparative Statement of Working Capital Requirement**

	Single Shift			Double Shift		
	Unit	Rate (₹)	Amount (₹)	Unit	Rate (₹)	Amount (₹)
Current Assets						
Inventories:						
Raw Materials	6,000	6.00	36,000	12,000	5.40	64,800
Work-in-Progress	2,000	11.00	22,000	2,000	9.40	18,800
Finished Goods	4,500	16.00	72,000	9,000	12.40	1,11,600
Sundry Debtors	6,000	16.00	96,000	12,000	12.40	1,48,800
Total Current Assets: (A)			2,26,000			3,44,000
Current Liabilities						
Creditors for Materials	4,000	6.00	24,000	8,000	5.40	43,200
Creditors for Wages	1,000	5.00	5,000	2,000	4.00	8,000
Creditors for Expenses	1,000	5.00	5,000	2,000	3.00	6,000
Total Current Liabilities: (B)			34,000			57,200
Working Capital: (A) – (B)			1,92,000			2,86,800

Additional Working Capital requirement = ₹ 2,86,800 – ₹ 1,92,000 = ₹ 94,800

Assessment of the impact of double shift to mitigate the immediate demand for next year only.

Workings:

(3) Calculation of no. of units to be sold:

No. of units to be Produced	48,000
Add: Opening stock of finished goods	4,500
Less: Closing stock of finished goods	(9,000)
No. of units to be Sold	43,500

(4) Calculation of Material to be consumed and materials to be purchased in units:

No. of units Produced	48,000
Add: Closing stock of WIP	2,000
Less: Opening stock of finished goods	(2,000)
Raw Materials to be consumed in units	48,000
Add: Closing stock of Raw material	12,000
Less: Opening stock of Raw material	(6,000)

CAPITAL BUDGETING

Raw Materials to be purchased (in units)	54,000
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Credit allowed by suppliers: $(54,000 * 5.40) * 2 \text{ months} / 12 \text{ months} = \text{Rs. } 48,600$;

Comparative Statement of Working Capital Requirement

	Single Shift			Double Shift		
	Unit	Rate (₹)	Amount (₹)	Unit	Rate (₹)	Amount (₹)
Current Assets						
Inventories:						
Raw Materials	6,000	6.00	36,000	12,000	5.40	64,800
Work-in-Progress	2,000	11.00	22,000	2,000	9.40	18,800
Finished Goods	4,500	16.00	72,000	9,000	12.40	1,11,600
Sundry Debtors	6,000	16.00	96,000	12,000	12.40	1,48,800
Total Current Assets: (A)			2,26,000			3,44,000
Current Liabilities						
Creditors for Materials	4,000	6.00	24,000	9,000	5.40	48,600
Creditors for Wages	1,000	5.00	5,000	2,000	4.00	8,000
Creditors for Expenses	1,000	5.00	5,000	2,000	3.00	6,000
Total Current Liabilities: (B)			34,000			62,600
Working Capital: (A) – (B)			1,92,000			2,81,400

Additional Working Capital requirement = ₹ 2,81,400 – ₹ 1,92,000 = ₹ 89,400

Notes:

- (i) The quantity of material in process will not change due to double shift working since work started in the first shift will be completed in the second shift.
- (ii) It is given in the question that the WIP is valued at prime cost hence, it is assumed that the WIP is 100% complete in respect of material and labour.
- (iii) In absence of any information on proportion of credit sales to total sales, debtors quantity has been doubled for double shift.
- (iv) It is assumed that all purchases are on credit.
- (v) The valuation of work-in-progress based on prime cost as per the policy of the company is as under.

	Single shift (₹)	Double shift (₹)
Materials	6.00	5.40
Wages – Variable	3.00	3.00
Fixed	2.00	1.00
	11.00	9.40