5. ADVANCED CONCEPTS IN INVESTMENT DECISIONS

ASSIGNMENT SOLUTIONS

PROBLEM NO: 1

Initial Cash Outflow:

	Model I	Model II
Cost of the Machine	Rs. 1,50,000	Rs. 2,50,000
Working Capital Required	50,000	70,000
Total	2,00,000	3,20,000

Subsequent Inflows (Annual): (Figures in Rs.)

	Year 1	Year 2	Year 3	Year 4	Year 5
Model I:					
Savings in Expenses	1,00,000	1,00,000	1,00,000	1,00,000	1,00,000
Less: Depreciation @ 25% WDV	37,500	28,125	21,094	15,820	-
Incremental earnings	62,500	71,875	78,906	84,180	1,00,000
Less: Tax @ 35%	21,875	25,156	27,617	29,463	35,000
Profit After Tax	40,625	46,719	51,289	54,717	65,000
Depreciation added back	37,500	28,125	21,094	15,820	-
Cash flow	78,125	74,844	72,383	70,537	65,000
PVF (13%, n)	0.885	0.783	0.693	0.613	0.543
PV (Rs.)	69,140	58,603	50,161	43,239	35,295
Total Present Value					2,56,438
Model II:					
Savings in Expenses	1,50,000	1,50,000	1,50,000	1,50,000	1,50,000
Less: Depreciation	62,500	46,875	35,156	26,367	-
Incremental Earnings	87,500	1,03,125	1,14,844	1,23,633	1,50,000
Less: Tax @ 35%	30,625	36,094	40,196	43,272	52,500
Profit After Tax	56,875	67,031	74,648	80,361	97,500
Depreciation added back	62,500	46,875	35,156	26,367	-
Cash flow	1,19,375	1,13,906	1,09,804	1,06,728	97,500
PVF (13%, n)	0.885	0.783	0.693	0.613	0.543
PV (Rs.)	1,05,647	89,188	76,094	65,424	52,943
Total Present Value					3,89,296

Terminal Cash Inflows:

	Model I	Model II
Release of working capital (A)	Rs. 50,000	Rs. 70,000
Short-term Capital loss:		
W.D.V of Asset	47,461	79,102
Salvage	Nil	Nil
Loss	47,461	79,102
Tax Saving @ 35% (B)	16,611	27,686
Net Cash Inflow (A + B)	66,611	97,686

Calculation of NPV:

	Model I	Model II
PV of Inflows (Annual)	Rs. 2,56,438	Rs. 3,89,296
PV of Terminal Inflow @ 13%		
(66,611 x 0.543)	36,170	-
(97,686 x 0.543)	-	53,044
	2,92,608	4,42,340
Less: Initial Outflow	2,00,000	3,20,000
Net Present Value	92,608	1,22,340

As both the proposals have positive NPV, both are acceptable. However, Model II should be preferred because it has higher NPV.

(**Note:** As there is no other in the same block of assets, there will not be any depreciation in the last year. However, the loss at the time of disposing of the asset is tax deductible at normal tax rate of 35%).

PROBLEM NO: 2

Initial Outflow:

Cost of New Machine	Rs. 15,00,000
Less: Scrap Value of Old machine	2,00,000
Net Outflow	13,00,000

Subsequent Inflow (Annual):

Year	Increase in Sales	Incremental Contribution	Depreciation	PBT	PAT	Cash Flows
1	Rs. 5,00,000	Rs. 3,50,000	Rs. 3,25,000	Rs. 25,000	Rs. 17,500	Rs. 3,42,500
2	5,00,000	3,50,000	2,43,750	1,06,250	74,375	3,18,125
3	5,00,000	3,50,000	1,82,813	1,67,187	1,17,030	2,99,843
4	5,00,000	3,50,000	1,37,109	2,12,891	1,49,024	2,86,133
5	5,00,000	3,50,000	1,02,832	2,47,168	1,73,018	2,75,850
6	5,00,000	3,50,000	39,624	3,10,376	2,17,263	2,56,887

Terminal Cash Inflow:

Scrap Value of New machine Rs. 1,50,000

Calculation of NPV:

Year	Cash Flow	PV (10%, n)	PV
0	Rs. 13,00,000	1.000	Rs. – 13,00,000
1	3,42,500	0.909	3,11,333
2	3,18,125	0.826	2,62,771
3	2,99,843	0.751	2,25,182
4	2,86,133	0.683	1,95,429
5	2,75,850	0.621	1,71,303
6	2,56,887	0.564	1,44,884
7	1,50,000	0.564	84,600
Net Present Value			95,502

As the NPV of the replacement proposal is positive, the proposal may be implemented.

Working Note:

Calculation of Depreciation: As there are other assets also in the same block of assets, the incremental cost of new machine (15,00,000 - 2,00,000) = 13,00,000 will be added to the cost of block of assets and depreciation on this amount of Rs. 13,00,000 will be available @ 25% WDV for 6 years. In the beginning of last year (i.e., 6th year), the WDV of Rs. 13,00,000 will be Rs. 3,08,496, out of which the scrap value of Rs. 1,50,000 will be deducted. So the amount available for depreciation in the 6th year is (3,08,496 - 1,50,000) = Rs. 1,58,496 and depreciation @ 25% would be Rs. 39,624 only.

PROBLEM NO: 3

Cash outflow

	Amount (Rs.)
Cost of new machine	2,50,000.00
Less: Sale of old machine	50,000.00
Less: Tax saving from loss due to sale of old machine Rs.40,000 (Rs.90,000 - Rs. 50,000) × 50%	20,000.00
Net Cash Outflow	1,80,000.00

	Amount before tax	Amount after tax
Cost savings	30,000	15,000
Tax savings on depreciation:		
New machine	25,000	
Old machine	10,000	
Differential depreciation	15,000	
Tax savings on Rs.15,000 @ 50%		7,500
Cash flow after tax (1 to 8 years)		22,500
Salvage value of new machine (9th year)		25,000
Cash flow after tax (9th year)		47,500

Determination of Net Present Value

Year	Cash inflow after tax (Rs.) (2)	Present value factor at (10%) (3)	Present value of cash inflows (Rs.) (4) = (2) x (3)
1 - 8	22,500	5.335	1,20,038
9	47,500	0.424	20,140
Total Cash Inflow			1,40,178
Less: Net Cash Outflow			1,80,000
Net Present Value			(39,822)

Decision: Since the net present value is negative, the old machine should not be replaced.

PROBLEM NO: 4

Step 1: Calculation of Incremental Depreciation

Particulars	Amount (Rs.)
Depreciation on New machine $\left(\frac{\text{Rs. } 10,00,000 - \text{Rs. } 40,000}{8 \text{ years}}\right)$	1,20,000 (per annum)
Depreciation on Old machine $\left(\frac{\text{Rs. } 3,30,000}{11 \text{ years}}\right)$	30,000 (per annum)
Incremental Depreciation	90,000 (per annum)

Step 2: Calculation of P.V of Incremental initial cash outflow

Particulars	Amount (Rs.)
Cost of New machine	10,00,000
Less: Sale proceeds of existing machine	(2,00,000)
Net incremental initial Cash Outflows	8,00,000

Step 3: Calculation of P.V of incremental Operating Cash inflows

Particulars		Amount (Rs.)
Incremental No. of units		45,000 Units
Incremental sales Revenue @ 15/- p.u		6,75,000
Less: Cost of Operation		
Material @ 4 per unit	1,80,000	
Labour (3,000 x 70 - 3,000 x 40)	90,000	(2,70,000)
Incremental Contribution		4,05,000
Less: Indirect Cash Cost		(15,000)
Incremental PBDT		3,90,000
Less: Incremental Depreciation		(90,000)
Incremental PBT		3,00,000
Less: Tax @ 30%		(90,000)
Incremental PAT		2,10,000
Add: Depreciation		90,000
Incremental CFAT		3,00,000

P.V thereof = Rs.3,00,000 x 4.968 = Rs.14,90,400

Step 4: Calculation of P.V of incremental terminal Cash inflows: Rs.40,000 x 0.404 = Rs.16,160

Step 5: Calculation of Incremental NPV: Rs.14,90,400 + 16,160 - 8,00,000 = Rs.7,06,560

Step 6: Decision making

Since incremental NPV is positive, it is advisable replace the existing machine with new machine.

PROBLEM NO: 5

From the given information Company has the following two options to replace the existing machine.

Option - I: Continuing the existing machine for two more years and replacing then.

Option - II: Replacing the existing machine with new machine as of now.

Step 1: Calculation of NPV for Option - I

Year	CFS (Rs.)	PVF @ 10%	P. values (Rs.)
1	50,000	0.909	45,450
2	30,000	0.826	24,780
2nd	60,000	0.826	49,560
			1,19,790

Equivalent Annual Value = 1,19,790 / 1.735 = 69,043.

Step 2: Calculation of equivalent annual Cash inflows for Option - II

Year	CFS (Rs.)	PVF @ 10%	P. values (Rs.)
0	70,000	1	(70,000)
1	90,000	0.909	81,810
2	90,000	0.826	74,340
3	90,000	0.751	67,590
			1,53,740

Equivalent Annual Value = Rs. 1,53,740 / 2.486 = Rs. 61,842.

Conclusion: Option I is better to opt due to higher equivalent annual value.

PROBLEM NO: 6

Calculation of PBP for Machinery X & Machinery Y:

Step 1: Calculation of Operating Cash Inflows

Particulars	Machine X (Rs.)	Machine Y (Rs.)
Savings		
i) Savings in Cost	500	800
ii) Savings in wages	6,000	8,000
Total Savings (A)	6,500	8,800
Costs		
i) Cost of Maintenance	800	1,000
ii) Cost of Supervision	1,200	1,800
Total Costs (B)	2,000	2,800
Net Savings	4,500	6,000

Step 2: Initial Investment

Particulars	Machine X (Rs.)	Machine Y (Rs.)
Cost of machinery	9,000	18,000

Step 3: Payback Period

Particulars	Machine X	Machine Y
Payback Period = $\frac{\text{Initial Cash outflow}}{\text{Annual Cash inflow}}$	2 years $\left(\frac{9,000}{4,500}\right)$	3 years $\left(\frac{18,000}{6,000}\right)$

PROBLEM NO. 7

Working Notes:

W.N.1: Net Sale Procedures of machine R as on today.

GSP/NSP of Machine R as on today	1,00,000
Less: Cost of dismantling and removal	30,000
NSP of Machine R as on today	70,000

W.N.2: NSP of Machine R after 5 years: GSP/NSP of Machine R after 5 years = 0

W.N.3: NSP of Machine S after 5 years: GSP/NSP of Machine S after 5 years = 0

PART A- Calculation of Net Present Value Using Incremental approach

Step - 1: Calculation of Net initial cash outflows

Particulars	Rs.
Cost of Machine S	2,50,000
Less: NSP of Machine R as on today (W.N-1)	70,000
P.V of Net Cash Outflows	**1,80,000**

Step - 2: Calculation of Net Present Value of operating cash inflows

Particulars	Machine R	Machine S
Sales Revenue (1,50,000x Rs. 6/unit	9,00,000	9,00,000
Less: Annual operating cost	3,00,000	1,80,000
Less: Fixed Cost (@ Rs. 3/ unit	4,50,000	4,50,000
CFAT p.a.	**2,50,000**	**2,70,000**

Incremental CFAT p.a. = 20,000 p.a. (2,70,000 - 2,50,000)

P.V of operating cash inflows = 20,000x PVAF (14%, 5yrs) = 20,000x3.432 = Rs. 68,640/-

Step-3: Present value of terminal cash inflows=0

Step-4: Calculation of Net present value

Net present value = Present Value of cash inflows - Present Value of cash outflows

= PV of operating cash inflows + PV of terminal cash inflows - PV of cash outflows

= 68,640 + 0 - 1,80,000= -1,11,360

Assumptions:

- Cash flows are assumed to accrue at the end of each year.
- Interim cash inflows at the end of each year are assumed to be reinvested at the rate of cost of capital
- Cash flows given in the problem are assumed to be certain

Conclusion: since NPV is negative, therefore machine R has to be continued without replacement

PART B - Calculation of net present value when machine R has not installed

Now machine R & S are two separate alternatives for decision making.

Step-1: Calculation of cash outflows

Particulars	Machine R	Machine S
Cost of the Machine	2,00,000	2,50,000

Step-2: Calculation of Present Value of operating cash inflows

Particulars	Machine R	Machine S
CFAT p.a.	2,50,000	2,70,000
PVAF (14%, 5yrs	3.432	3.432
P.V there of	8,58,000	9,26,640

Step-3: Calculation of Present Value of Terminal cash inflows

Particulars	Machine R	Machine S
P.V of Terminal C.I	0	0

Step-4: Calculation of Net Present Value

Net present value = PV of cash inflows- PV of cash outflows

= PV of operating cash inflows + PV of terminal cash inflows - PV of cash outflows

Particulars	Machine R	Machine S
NPV	8,58,000 - 2,00,000 = 6,58,000	9,26,64,0 - 2,50,000 = 6,76,640

Assumptions:

- Cash flows are assumed to accrue at the end of each year.
- Interim cash inflows at the end of each year are assumed to be reinvested at the rate of cost of capital
- Cash flows given in the problem are assumed to be certain.

Conclusion: since NPV is negative, therefore machine R has to be continued without replacement.

Decision: since machine S has highest NPV, it has to be selected.

PROBLEM NO. 8

i) Initial Cash Outflows: **(Rs. in Lakhs)**

Particulars	A	B
Cost of Machine	5.00	5.00
Cost of Utilities	1.00	2.00
Salvage of Old Machine	(1.00)	(1.00)
Salvage of Old Utilities	-	(0.20)
Initial Cash Outflows:	5.00	5.80

ii) Discounted Value of Cash inflows: **(Rs. in Lakhs)**

Year	NPV Factor @ 15%	Machine A		Machine B	
		Cash inflows	Discounted value of inflows	Cash inflows	Discounted value of inflows
0	1.00	(5.00)	(5.00)	(5.80)	(5.80)
1	0.87	1.00	0.87	2.00	1.74
2	0.76	1.50	1.14	2.10	1.60
3	0.66	1.80	1.19	1.80	1.19
4	0.57	2.00	1.14	1.70	0.97
5	0.50	1.70	0.85	0.40	0.20
Salvage	0.50	0.50	0.25	0.60	0.30
Total			5.44		6.00
NPV			(+) 0.44		(+) 0.20

Since the Net present Value of both the machines is positive both are acceptable.

iii) Discounted Pay-back Period: **(Rs. in lakhs)**

Year	Machine A		Machine B	
	Discounted cash inflows	Cumulative Discounted cash inflows	Discounted cash inflows	Cumulative Discounted cash inflows
1	0.87	0.87	1.74	1.74
2	1.14	2.01	1.60	3.34
3	1.19	3.20	1.19	4.53
4	1.14	4.34	0.97	5.50
5	1.10*	5.44	0.50	6.00

* Includes salvage value

Discounted Payback Period (For A and B):

$$4\text{Years} + \left(\frac{0.66}{1.10}\right) \times 1 = 4.6\text{Years} \qquad 4\text{Years} + \left(\frac{0.30}{0.50}\right) \times 1 = 4.6\text{Years}$$

Profitability Index: $\frac{\text{Sum of present value of net cash inflow}}{\text{Initial cash outlay}}$

$$\frac{\text{Rs. 5.44 lakhs}}{\text{Rs. 5.00 lakhs}} = 1.088 \text{ (A)} \quad \frac{\text{Rs. 6.00 lakhs}}{\text{Rs. 5.00 lakhs}} = 1.034 \text{ (B)}$$

iv) Since the absolute surplus in the case of A is more than B and also the desirability factor, it is better to choose A.

The discounted payback period in both the cases is same, also the net present value is positive in both the cases but the desirability factor (profitability index) is higher in the case of Machine A, it is therefore better to choose Machine A

PROBLEM NO: 9

Step 1: Calculation of modified NPV for Project X

Calculation of Modified Value

Year	CFS (Rs.)	No. of years	Re-invest Rate	FVF @ 15%	FV (Rs.)
1	40,000	6	15%	2.313	92,520
2	50,000	5	15%	2.011	1,00,550
3	60,000	4	15%	1.749	1,04,940
4	70,000	3	15%	1.521	1,06,470
5	80,000	2	15%	1.322	1,05,760
6	90,000	1	15%	1.150	1,03,500
7	1,00,000	0	15%	1.000	1,00,000
					7,13,740

Modified NPV = (Rs. 7,13,740 x 0.425) - 3,00,000 = Rs.3,03,339.5 - 3,00,000 = Rs.3,339.5

Step 2: Calculation of modified NPV for project Y

Year	CFS (Rs.)	No. of years	Re-invested rate	FVF@15%	FV (Rs.)
1	80,000	6	15%	2.313	1,85,040
2	70,000	5	15%	2.011	1,40,770
3	60,000	4	15%	1.749	1,04,940
4	60,000	3	15%	1.521	91,260
5	50,000	2	15%	1.322	66,100
6	40,000	1	15%	1.150	46,000
7	30,000	0	15%	1.000	30,000
					6,64,110

Modified NPV = (6,64,110 x 0.425) - 3,00,000 = (Rs. 17,753)

PROBLEM NO: 10

Calculation of Modified Value

Year	CFS (Rs.)	No. of years	Re-investment Rate	FVF @ 4%	F values (Rs.)
1	50,000	3	4%	1.125	56,250
2	40,000	2	4%	1.082	43,280
3	30,000	1	4%	1.040	31,200
4	10,000	0	4%	1.000	10,000
					1,40,730

Calculation of Modified IRR

Particulars	Amount (Rs)
Initial investment (PV)	1,00,000
Terminal Value (FV)	1,40,730
No. of years	4 years
FV	PV x FVF (n years r %)
1,40,730	1,00,000 x FVF (4 years r %)
FVF(4 years, r%) = 1.4073	

Trace this Value against 4 years in FVF Table, r = 9%

∴ Modified IRR = 9%

PROBLEM NO. 11

i) Calculation of Net Present Value for each project:

Year	Cash flows Project A	Cash flows Project B	PVF @ 10%	PV of Project A (Rs.)	PV of Project B (Rs.)
0	(1,00,000)	(3,00,000)	1	(1,00,000)	(3,00,000)
1	50,000	1,40,000	0.909	45,450	1,27,260
2	60,000	1,90,000	0.826	49,560	1,56,940
3	40,000	1,00,000	0.751	30,040	75,100
NPV				**25,050**	**59,300**

ii) Calculation of Internal Rate of Return for each project:

Since by discounting cash flows at 10% we are getting values very far from zero. Therefore, let us discount cash flows using 20%discounting rate.

Year	Cash flows Project A	Cash flows Project B	PVF @ 20%	PV of Project A (Rs.)	PV of Project B (Rs.)
0	(1,00,000)	(3,00,000)	1.000	(1,00,000)	(3,00,000)
1	50,000	1,40,000	0.833	41,650	1,16,620
2	60,000	1,90,000	0.694	41,640	1,31,860
3	40,000	1,00,000	0.579	23,160	57,900
NPV				**6,450**	**6,380**

Since by discounting cash flows at 20%we are getting values very far from zero. Therefore, let us discount cash flows using 25%discounting rate.

Year	Cash flows Project A	Cash flows Project B	PVF @ 25%	PV of Project A (Rs.)	PV of Project B (Rs.)
0	(1,00,000)	(3,00,000)	1.000	(1,00,000)	(3,00,000)
1	50,000	1,40,000	0.800	40,000	1,12,000
2	60,000	1,90,000	0.640	38,400	1,21,600
3	40,000	1,00,000	0.512	20,480	51,200
NPV				**(1,120)**	**(15,200)**

The internal Rate of Return is, thus more than 20% but less than 25%. The exact rate can be obtained by interpolation:

$$IRR = LR + \frac{NPV@LR}{NPV@LR - NPV@HR} x HR - LR$$

$$IRR \text{ of Project A} = 20\% + \frac{6,450}{6,450 - (1,120)} X (25\% - 20\%) = 20\% + \frac{6,450}{7,570} x5\% = 24.26\ \% \text{ (approx.)}$$

$$IRR \text{ of Project B} = 20\% + \frac{6,380}{6,380 - (15,200)} X (25\% - 20\%) = 20\% + \frac{6,380}{21,580} X5\% = 21.48\% \text{ (approx.)}$$

Overall Position:

Particulars	Project A	Project B
NPV @ 10%	25,050	59,300
IRR	24.26%	21.48%

According to NPV, Project 'B' is preferable and according to IRR, Project 'A' is preferable. Therefore, there is a conflict in ranking of projects between NPV & IRR.

Reasons for conflict:

a) Projects are mutually exclusive.

b) Size disparity (difference in size of projects)

Conflict Resolution: (For Academic interest only)

Although from NPV point of view Project B appears to be better but from IRR point of view Project A appears to be better. Since, both the projects have unequal sizes, selection on the basis of these two methods shall not be proper. In such a situation we shall use any of the following methods:

i) Incremental Net Present Value criterion:

Year	Incremental Cash flows	PVF @ 10%	Present Value
0	(2,00,000)	1	(2,00,000)
1	90,000	0.909	81,810
2	1,30,000	0.826	1,07,380
3	60,000	0.751	45,060
Net Present Value			**34,250**

Since incremental NPV is positive, then it is beneficial to invest in bigger Project i.e. project 'B'.

ii) Incremental Internal Rate of Return criterion:

Year	Incremental Cash flows	NPV at Lower guess rate of 19%		NPV at Higher guess rate of 20%	
		PVF @ 19%	PV	PVF @ 20%	PV
0	(2,00,000)	1	(2,00,000)	1	(2,00,000)
1	90,000	0.840	75,600	0.833	74,970
2	1,30,000	0.706	91,780	0.694	90,220
3	60,000	0.593	35,580	0.579	34,740
NPV			**2,960**		**(70)**

Using Interpolation, IRR = $LR + \frac{NPV@LR}{NPV@LR - NPV@HR}(HR - LR)$

$= 19\% + \frac{2,960}{2,960 - (70)}(20\% - 19\%) = 19.98\%$ (Approx.)

Since Incremental IRR, 19.98% is greater than cost of capital (10%) therefore, it is beneficial to invest in bigger project i.e. Project 'B'.

PROBLEM NO: 12

Step 1: Calculation of Depreciation for both the projects

	Project X	Project Y
Cost of the project	120 lacs	120 lacs
Salvage value	-	-
Estimated use full life	8 Years	6Years
Depreciation	15 lacs	20 lacs

Step 2: Calculation of NPV

Years	PVF @ 15%	Project X		Project Y	
		Cash inflows	PV Cash flows	Cash inflows	PV Cash flows
0	1.00	(120)	(120)	(120)	(120)
1	0.870	25	21.75	40	34.8
2	0.756	35	26.46	60	45.36
3	0.658	45	29.61	80	52.64
4	0.572	65	37.18	50	28.6
5	0.497	65	32.31	30	14.91
6	0.432	55	23.76	20	8.64
7	0.376	35	13.16	-	-
8	0.327	15	4.91	-	-
	4.488		NPV = 69.14		NPV = 64.95

Step 3: Calculation of Annualized NPV:

Project X $= \frac{NPV}{PVAF(r,n)} = \frac{69.14}{PVAF(15\%,8years)} = \frac{69.14}{4.488}$ = 15.4 lacs

Project Y $= \frac{NPV}{PVAF(r,n)} = \frac{64.95}{PVAF(15\%,6years)} = \frac{64.95}{3.785}$ = 17.16 lacs

Since annualized NPV more, it is beneficial to select project Y.

PROBLEM NO: 13

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) x (iii)]	[(ii) x (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.

PROBLEM NO: 14

Step 1: Equivalent Annual Cost of Machinery A **(Amount Rs.)**

Year	Cash Flows (Rs.)	PVF @ 9%	Present values (Rs.)
0	7,50,000	1	7,50,000
1 to 3	2,00,000	2.531	5,06,200
			12,56,200

Equivalent Annual Cost = $\frac{\text{PVCOF}}{\text{PVAF(3,9\%)}} = \frac{12,56,200}{2.531}$ (COF - cash out flows) = 4,96,325

Step 2: Equivalent Annual Cost of Mach B

Year	Cash Flows (Rs.)	PVF @ 9%	Present values (Rs.)
0	5,00,000	1	5,00,000
1 to 2	3,00,000	1.759	5,27,700
			10,27,700

Equivalent Annual Cost = $\frac{\text{PVCOF}}{\text{PVAF(2,9\%)}} = \frac{\text{Rs. } 10,27,700}{1.759}$ = Rs. 5,84,252

Step 3: Decision Since equivalent Annual Cost of machinery A is Lower than equivalent Annual Cost of machinery B, it is advisable to accept machine A.

PROBLEM NO: 15

Step 1: Equivalent Annual Cost of Machinery EM

Year	Description	Cash Flows (Rs.)	PVF @ 14%	Present values (Rs.)
0	Purchase	10,00,000	1	10,00,000
1 to 12	Repairs	1,00,000	5.660	5,66,000
8th	Overhauling	2,00,000	0.351	70,200
12th	Scrap	(1,50,000)	0.208	(31,200)
				16,05,000

Equivalent Annual Cost = $\frac{\text{PVCOF}}{\text{PVAF (12,14\%)}} = \frac{\text{Rs. } 16,05,000}{5.660}$ = Rs. 2,83,569.

Step 2: Equivalent Annual Cost of Machinery LM

Year	Description	Cash Flows (Rs.)	PVF @ 14%	Present values (Rs.)
0	Purchase	7,00,000	1	7,00,000
1 to 6	Repair	1,40,000	3.889	5,44,460
4th	Overhauling	1,00,000	0.592	59,200
6th	Scrap	(1,50,000)	0.456	(68,400)
				12,35,260

Equivalent Annual Cost $= \frac{\text{PVCOF}}{\text{PVAF (6,14\%)}} = \frac{\text{Rs.12,35,260}}{3.889}$ = Rs. 3,17,629

Step 3: Decision: Select machine EM

PROBLEM NO: 16

Step 1: Base case NPV

Year	CF (Rs. lakhs)	DF	DCF
0	(10,00,000)	1.000	(10,00,000)
1 - 10	2,00,000	5.650	11,30,000
		Total	1,30,000

Step 2: Issue costs

a) This is 5% of gross proceeds.

b) Hence if 100 is gross proceeds 95 is net proceeds and Rs. 5 is issue costs.

c) Since net proceeds are 10 lakhs issue cost is 5/95 x 10 lakhs = Rs. 52,632.

Step 3: PV of tax saved on interest paid (at 6%)

Year	Opening	Interest	Principal	Closing	Tax saved	DF	PV (Rs.)
1	5,00,000	30,000	50,000	4,50,000	15,000	0.943	14,145
2	4,50,000	27,000	50,000	4,00,000	13,500	0.890	12,015
3	4,00,000	24,000	50,000	3,50,000	12,000	0.840	10,080
4	3,50,000	21,000	50,000	3,00,000	10,500	0.792	8,316
5	3,00,000	18,000	50,000	2,50,000	9,000	0.747	6,723
6	2,50,000	15,000	50,000	2,00,000	7,500	0.705	5,288
7	2,00,000	12,000	50,000	1,50,000	6,000	0.665	3,990
8	1,50,000	9,000	50,000	1,00,000	4,500	0.627	2,822
9	1,00,000	6,000	50,000	50,000	3,000	0.592	1,776
10	50,000	3,000	50,000	0	1,500	0.558	837
						Total	65,992

Step 4: Compute ANPV

NPV (Step 1)	1,30,000
Less: Issue costs Step 2	(52,632)
Add: Tax saved on interest paid Step 3	65,992
Total ANPV	1,43,360

Conclusion: The project has an adjusted positive ANPV and should be selected.

PROBLEM NO: 17

Cash Flows: The cash flows have recognized inflation. Hence they are in money terms.

Discount Rate: The given discount rate of 10% is assumed to be in real terms. To compute Money

(1 + MDR) = (1 + RDR) x (1 + IR) = 1.10 x 1.05 = 1.155

NPV calculations:

Year	Money cash flows	DF @ 15.5%	PV of cash flows
0	(70)	1.000	(70)
1	30	0.866	25.98
2	40	0.749	29.96
3	30	0.649	19.47
		NPV	5.41

Decision: Since the NPV is positive the project should be accepted.

THE END