Assignment-4

Question 1:-A company XYZ Pvt Ltd. have four alternatives to purchase reactors, but due to financial reasons they can only purchase one reactors. All cash inflows after taxes (CF) and initial cost are given below in table and they are unequally spread throughout year, all reactors have same life span of 7 years. If company wants to recover all its investment within 4 years, then determine which alternative they should choose to purchase the reactors on the basis of payback period?

[3 marks]

Alternatives → **Cash Flow (CF) ↓**	**A**	**B**	**C**	**D**
Initial cost	Rs.70,000	Rs.12,40,000	Rs.1,80,000	Rs.5,40,000
CF Year 1	Rs.24,000	Rs.47,200	Rs.20,000	Rs.2,04,000
CF Year 2	Rs.24,000	Rs.1,80,000	Rs.17,000	Rs.1,57,000
CF Year 3	Rs.24,000	Rs.73,500	Rs.38,000	Rs.2,50,000
CF Year 4	Rs.24,000	Rs.26,700	Rs.76,000	Rs.75,000
CF Year 5	Rs.24,000	Rs.2,00,000	Rs.27,000	Rs.25,000
CF Year 6	Rs.24,000	Rs.4,50,000	Rs.13,000	Rs.16,000
CF Year 7	Rs.24,000	Rs.73,000	Rs.2,20,000	Rs.0

a) A
b) B
c) C
d) D

Sol. Given:-

Service life of equipment (n) = 7 years

Cut=off year for recovery = 4 years

Initial Cost of equipment's for alternative:-

I_A = Rs.70,000I_B = Rs.12,40,000 I_C= Rs.1,80,000 I_D = Rs.5,40,000

	Annual cash inflow after taxes		**Cumulative annual cash inflow after taxes**	
Years	**Alternative (A)**	**Alternative (B)**	**Alternative (A)**	**Alternative (B)**
1	Rs.24,000	Rs.47,200	Rs.24,000	Rs.47,200

2	Rs.24,000	Rs.1,80,000	Rs.48,000	Rs.2,27,200
3	Rs.24,000	Rs.73,500	Rs.72,000	Rs.9,62,200
4	Rs.24,000	Rs.26,700	Rs.96,000	Rs.9,88,900
5	Rs.24,000	Rs.2,00,000	Rs.1,20,000	Rs.11,88,900
6	Rs.24,000	Rs.4,50,000	Rs.1,44,000	Rs.16,38,900
7	Rs.24,000	Rs.73,000	Rs.1,68,000	Rs.17,11,900

As the cost of the equipment according to "A" is Rs.70,000, it's Payback period will be more than 2 years as this figure falls between cumulative cash inflows after tax (CF) for the year 2 and 3. Up to the end of 2^{nd} year Rs.48,000 will be recovered for equipment according to "A".

Balance has to be recovered in 3^{rd} year = Rs.70000 – Rs.48000 = Rs.22000

The cash inflow after tax for the 3^{rd} year is Rs.24000.

Hence, the balance amount Rs.22000 can be recovered = $\frac{22000}{24000}$ = 0.916 years

Thus the Payback period of equipment for **"A"** is **2.916 year** **(accept because payback period less than cut-off period).**

Similarly, cost of the equipment according to "B" is Rs.12,40,000, it's Payback period will be more than 5 years as this figure falls between cumulative cash inflows after tax for the year 5 and 6. Up to the end of 5^{th} year Rs.11,88,900 will be recovered of equipment for "B".

Balance has to be recovered in 6^{th} year = Rs.12,40,000 – Rs.1188000 = Rs.52000

The cash inflow after tax for the 6^{th} year is Rs.4,50,000.

Hence, the balance amount Rs.52000 can be recovered = $\frac{52000}{450000}$ = 0.115 years

Thus the Payback period of equipment for **"B"**is**5.115 year** **(not accept because payback period more than cut-off period).**

	Annual cash inflow after taxes		**Cumulative annual cash inflow after taxes**	
Years	**Alternative (C)**	**Alternative (D)**	**Alternative (C)**	**Alternative (D)**
1	Rs.20,000	Rs.2,04,000	Rs.20,000	Rs.2,04,000
2	Rs.17,000	Rs.1,57,000	Rs.37,000	Rs.3,61,000
3	Rs.38,000	Rs.2,50,000	Rs.75,000	Rs.6,11,000
4	Rs.76,000	Rs.75,000	Rs.1,51,000	Rs.6.86,000
5	Rs.27,000	Rs.25,000	Rs.1,78,000	Rs.7,11,000
6	Rs.13,000	Rs.16,000	Rs.1,91,000	Rs.7,27,000
7	Rs.2,20,000	Rs.0	Rs.2,13,000	Rs.7,27,000

As the cost of the equipment according to "C" is Rs.1,80,000, it's Payback period will be more than 5 years as this figure falls between cumulative cash inflows after tax for the year 5 and 6. Up to the end of 5^{th} year Rs.1,78,000 will be recovered for equipment according to "C".

Balance has to be recovered in 6^{th} year = Rs.1,80,000 – Rs.1,78,000 = Rs.2000

The cash inflow after tax for the 6^{th}year is Rs.13000.

Hence, the balance amount Rs.2000 can be recovered = $\frac{2000}{13000}$ = 0.153 years

Thus the Payback period of equipment for **"C"** is **5.153 year** **(not accept because payback period more than cut-off period).**

Similarly, cost of the equipment according to "D" is Rs.5,40,000, it's Payback period will be more than 2 years as this figure falls between cumulative cash inflows after tax for the year 2 and 3. Up to the end of 2^{nd} year Rs.3,61,00 will be recovered of equipment for "D".

Balance has to be recovered in 3^{rd} year = Rs.5,40,000 – Rs.3,61,000 = Rs.179000

The cash inflow after tax for the 3^{rd}year is Rs.2,50,000.

Hence, the balance amount Rs.179000 can be recovered = $\frac{179000}{250000}$ = 0.716 years

Thus the Payback period of equipment for **"D"**is**2.716 year** **(accept because payback period less than cut-off period).**

Question 2:-ABC Company made an initial investment of Rs.2,50,000 on a machine and expected to get annual cash inflow of Rs.45,000 each year for its whole operational life of 8 years. Depreciation is allowed on straight line basis. Scrap value of machine is estimate to be Rs.60,300 at the end of its service life. Calculate its annual rate of return assuming that all other expenses including income tax are NIL?

[2 marks]

a) 8.515%
b) 13.88%
c) 9.754%
d) 12.97%

Sol. Given:-

Initial Investment or cost (V)= Rs.2,50,000

Annual cash inflow each year = Rs.45,000

Scrap value (V_S)= Rs.60,300

Service life (n) = 8 years

Annual depreciation based on straight line method,

$$d = \frac{\text{Initial cost} - \text{Scrap value}}{\text{service life}}$$

$d = \frac{250000-60300}{8} = \frac{189700}{8} = \text{Rs.}\,23{,}712.5$ (Same for all years)

Netprofit each year = Cash inflow – depreciation

- ⇨ 45000 – 23712.5
- ⇨ Rs.21,287.5

Annual rate of return = $\frac{\text{Net profit}\times 100}{\text{Total capital investment}} = \frac{21287.5\times 100}{250000} = 8.515\%$

Annual rate of return = 8.515%

Question 3:- A chemical company purchased a reactor to increase its revenue and to full fill the supply for demand. The yearly cash inflow after tax payment is mentioned in the table. The data for machine is given below:

Initial fixed cost of machine	Rs.12,00,00
Service life of machine	10 years
Income tax rate	30%
Minimum acceptable rate of return	18%
Working capital of machine	Rs.2,00,000
Salvage value of machine	Rs.70,000

Years	**Revenue after income tax (Rs.)**
1	2,48,881
2	2,57,968
3	3,12,661
4	4,23,654
5	4,56,221
6	5,85,911
7	6,96,880
8	9,78,576
9	9,98,765
10	11,65,980

If depreciation is based on straight line method what will be the net return on rector?

[5 marks]

a) **Rs.27,01,497**
b) Rs.31,84,403
c) Rs.24,55,757
d) Rs.26,78,722

Sol. Given:-

Initial Fixed capital of plant $= Rs.\,12{,}00{,}000$

Service life of plant (N) = 10 years

Income tax rate = 30%

Minimum acceptable rate of return (m_{ar})= 18%

Working capital for plant = Rs.2, 00,000

Salvage value at the end of service life = Rs.70, 000

Total capital investment (F) = Rs.12,00,000 + Rs.2,00,000 = Rs.14,00,000

$$Average\ net\ return = \frac{Net\ return}{Service\ life}$$

$$R_n = R_{n,avg.} \times N$$

$$R_{n,avg.} = N_{p,avg.} - m_{ar}F$$

$$N_{p,j} = Revenue(1 - Tax\ rate) - (cash\ expenses + depreciation)(1 - Tax\ rate)$$

Revenue after tax = Revenue*(1-Tax rate)

Cash expenses = 0

$$N_{p,j} = Revenue\ after\ tax - depreciation \times (1 - Tax\ rate)$$

$$Depreciation\ (d) = \frac{\text{Initial cost} - \text{Scrp value}}{\text{service life}} = \frac{1200000 - 70000}{10} = Rs.\,1{,}13{,}000$$

$$N_{p,j} = Revenue\ after\ tax - 243000 \times (1 - 0.20) = Revenue\ after\ tax - 90400$$

$$N_{p,1} = Rs.\,2{,}48{,}881 - Rs.\,90400 = Rs.\,1{,}58{,}481$$

$$N_{p,2} = Rs.\,2{,}57{,}968 - Rs.\,90400 = Rs.\,1{,}67{,}568$$

$N_{p,3} = Rs.\,3{,}12{,}661 - Rs.\,90400 = Rs.2,\ 22{,}261$

$$N_{p,4} = Rs.\,4{,}23{,}654 - Rs.\,90400 = Rs.\,3{,}33{,}254$$

$$N_{p,5} = Rs.\,4{,}56{,}221 - Rs.\,90400 = Rs.\,3{,}65{,}821$$

$$N_{p,6} = Rs.5,85,911 - Rs.90400 = Rs.4,95,511$$

$$N_{p,7} = Rs.6,96,880 - Rs.90400 = Rs.6,06,480$$

$$N_{p,8} = Rs.9,78,576 - Rs.90400 = Rs.8,81,176$$

$$N_{p,9} = Rs.9,98,765 - Rs.194400 = Rs.9,08,365$$

$$N_{p,10} = Rs.11,65,980 - Rs.194400 = Rs.10,75,580$$

$$\sum_{j=1}^{N} \mathrm{N_{p,j}} = Rs.52,21,497$$

$N_{P,avg.} = \left(\frac{1}{10}\right) \times 5221497 = Rs.5,22,149.7$

$$R_{n,avg.} = N_{p,avg.} - m_{ar}F$$

$$R_n = N \times N_{p,avg.} - m_{ar} \times N \times F$$

$$R_n = 10 \times 5,22,149.7 - 0.18 \times 10 \times 1200000$$

$$\boxed{\boldsymbol{R_n = Rs.27,01,497}}$$

Question 4:- ABC Ltd. wants to undertake a project which would yield an annual profit (after tax and depreciation) of Rs.1,60,000 for 8 years. The initial cost of the project would be Rs.900,000 and assets scrap value would have Rs.80,000 at the end of project life. What would be the average rate of return (ARR) at the end of this project?

[2 marks]

a) 23.43%
b) 31.15%
c) 32..65%
d) 24.65%

Sol. Given:-

Initial cost of the project = Rs. 900,000

Salvage value = Rs. 80, 000

Service life = 8 years

Annual profit after tax and depreciation = Rs.1,60,000

Net working capital = Rs. 0

Average rate of return (ARR) = $\frac{Annual\ profit\ after\ depreciation}{Average\ annual\ investment} \times 100$

Average investment = Net working capital + Salvage value + 0.5(initial cost of the machines of project-salvage value)

Average investment = 0 + 80000 + 0.5*(900000 - 80000) = Rs. 4,90,000

$$ARR = \frac{160000}{490000} \times 100 = \mathbf{32.65}\%$$

Question 5:- A company decided to establish a plant with a service life of 8 years, for this project the company has two alternatives Plan-1 and Plan-2. The initial cost of Plan 1 and 2 are Rs.35000 and Rs.25000 respectively. Rate of return for this project is 16.5%. The cash inflow after tax for both plans are given in table below. Company also decided that the revenue obtained from sales will again reinvested in to the market to get profit. The revenue from Plan-1 will be reinvest at the rate of 4% for first 5 years and after that at the rate of 7.5 %. Similarly the revenue of Plan-2 will be reinvest at the rate of 7.5% for whole service life. What will be the present value (PV) of compounded sum of cash inflows for plan-1(PV1) and Plan-2(PV2)?

[5 marks]

Years	**Cash inflow after income tax (Rs.)**	
Initial cost of machine	35000	25000
CF 1	12460	7890
CF 2	7890	8780
CF 3	10380	14321
CF 4	14480	16728
CF 5	5678	8431
CF 6	8765	7835
CF 7	3241	2313
CF 8	15000	12000

a) PV-1 = Rs.23458.18 ; PV-2 = Rs.32603.18
b) PV-1 = Rs.32603.18 ; PV-2 = Rs.23458.18
c) PV-1 = Rs.26803.18 ; PV-2 = Rs.30518.18
d) PV-1 = Rs.30518.19 ; PV-2 = Rs.26803.18

Sol. Given:-

	P-1	**P-2**
Initial cost	Rs.35000	Rs.25000

Cost of capital	16.5%	16.5%
Service life	8 years	8 years
Interest on reinvestment	4% for first 5 years and 7.5% for further years	7.5% for whole life span

Calculation for alternative P-1:-

Cash inflow of 1st year is invested up to the end of the project which is 8 years. Hence, investment period is 8-1=7 years (as the cash inflow of 1st is at the end of 1st year).

So it will grow at the rate of 4% for 7 years which comes out to be = $12460*(1+0.04)^7$ = 12460*1.3159= Rs.16396.114

Cash inflow of 2nd year is invested up to the end of the project which is 8 years. Hence, investment period is 8-2=6 years (as the cash inflow of 2nd is at the end of 2nd year).

So it will grow at the rate of 4% for 6 years which comes out to be = $7890*(1+0.04)^6$ = 7890*1.2653= Rs.9983.217

Year	Cash flow after tax (Rs)	Rate of int.%	Inv. Duration	Compounding Factor		Compounded Value (Rs)
1	12460	4	7	1.315931		16396.50
2	7890	4	6	1.265319		9983.37
3	10380	4	5	1.216653		12628.86
4	14480	4	4	1.16985		16939.43
5	5678	4	3	1.124864		6386.98
6	8765	7.5	2	1.155625		10129.05
7	3241	7.5	1	1.075		3484.08
8	15000	7.5	0	1		15000
					Sum	**90948.27**

Calculation for alternative P-2:-

Year	Cash flow after tax (Rs)	Rate of int.%	Inv. Duration	Compounding Factor		Compounded Value (Rs)
1	7890	7.5	7	1.65904		13089.83
2	8780	7.5	6	1.54330		13550.17
3	14321	7.5	5	1.43563		20559.66
4	16728	7.5	4	1.33547		22339.74
5	8431	7.5	3	1.24229		10473.75
6	7835	7.5	2	1.155625		9054.32
7	2313	7.5	1	1.075		2486.48
8	12000	7.5	0	1		12000
					Sum	**103554**

The sum of compounded value of P-1 and P-2 are Rs.90948.258 and Rs.103553.942 respectively discounted at the rate of 16.5% (cost of capital) for 8 years.

$$\text{Disounting factor for 8 years} = \frac{1}{(1.165)^8} = 0.294708$$

Thus **the present value of compounded sum** of cash inflow for

P-1:- => 90948.27*0.294708= **Rs.26803.18**

P-2:- => 103554*0.294708= **Rs.30518.19**

Question 6:- A company initially invested Rs.68,50,000 to establish a bottling plant and its uniform yearly cash flows is Rs.20,50,000 then what is the payback period. If company pays tax at the rate of 18%?

[1 marks]

a) 3.34 years
b) 4.34 years
c) 5.1 years
d) 4.1 years

Sol. Given:-

Initial Investment **=** Rs.68,50,000

Cash inflow each year = Rs.20,50,000

Cash inflow after tax = revenue*(1-tax rate) = 2050000*(1-0.18) = **Rs.16,81,000**

Payback Period (PB) = Cost of Project / Annual Cash Inflows after tax

Payback Period (PB) = 6850000/1681000 **= 4.07 or 4.1 years**

Question 7:- A company wants to purchase a machine for which it have two alternatives of two different machines "A" and "B" from the data given below for its selection:

Cost of capital(r) : 12%

Initial cost of equipment "A": Rs.12,000

Initial cost of equipment "B": Rs.20,500

Years	**Cash inflow (CF) after tax**	
	Machine-A	**Machine-B**
CF 1	3560	1870
CF 2	3890	2400
CF 3	2465	7650
CF 4	4530	3540
CF 5	5670	8320
Sum	20115	23780

Which machine should the company purchase on the basis of present value method?

[4 marks]

a) Machine-A
b) Machine-B
c) Both Machine-A & B
d) Data insufficient

Sol. Given:-

Cost of capital(r) : 12%

Initial cost of equipment "A": Rs.12,000

Initial cost of equipment "B": Rs.20,500

Machine "A"

Present value (PV) factor for year 1= 1/(1+0.12)=0.8928

PV of 1^{st} year cash flow = 3560*0.8928=Rs.3178.37

Present value (PV) factor for year 2= $1/(1+0.12)^2$=0.7972

PV of 2nd year cash flow = 3890*0.7972= Rs.3101.11

Present value (PV) factor for year 3= $1/(1+0.12)^3$=0.71178

PV of 3rd year cash flow = 2465*0.71178= Rs.1754.53

Present value (PV) factor for year 4= $1/(1+0.12)^4$=0.6355

PV of 4^{th}year cash flow = 4530*0.6355= Rs.2878.815

Present value (PV) factor for year 5= $1/(1+0.12)^5$=0.5674

PV of 5^{th}year cash flow = 5670*0.5674= Rs.3217.158

Similarly the cash flow of the Machine "B" is converted into present values

Years	**Cash flow after tax**		**PV factor ($1/(1+r)^N$)**	**Present value**	
	Machine-A	**Machine-B**		**Machine-A**	**Machine-B**
CF 1	3560	1870	0.8928	3178.37	1669.536
CF 2	3890	2400	0.7972	3101.11	1913.28
CF 3	2465	7650	0.71178	1754.53	5445.117
CF 4	4530	3540	0.6355	2878.815	2249.67
CF 5	5670	8320	0.5674	3217.158	4720.768
Sum	**20115**	**23780**		**14130**	**15998.371**

The present value of investment for Machine "A" is Rs.12,000 (cash outflow) whereas the present value of earnings(cash inflow) Rs.14,130. Similarly the present value of investment for Machine "B" is Rs.20,500 (cash outflow) whereas the present value of earnings(cash inflow) Rs.15,998.371. As for machine"A" the present value of cash outflow is less than cash inflow machines is accepted and machine B is rejected because its cash outflow is more than cash inflow.

Question 8:-Choose the most desirable investment proposal from the following alternative proposals using profitability index method:

[1 marks]

	Proposal X	**Proposal Y**	**Proposal Z**
Present value of net cash flow	Rs.2,12,000	Rs.1,71,800	Rs.1,85,200
Amount required to invest	Rs.2,00,000	Rs.1,60,000	Rs.1,80,000

a) X

b) Z

c) Y

Sol.

Because each investment proposal requires a different amount of investment, the most desirable investment can be found using profitability index. Profitabilityindex of all three proposals is computed below:

ProfitabilityIndex		
Proposal X	1.06	(212,000/200,000)
Proposal Y	1.07	(171,800/160,000)
Proposal Z	1.03	(185,200/180,000)

Proposal X has the highest net present value but is not the most desirable investment. The profitability indexes show proposal Y as the most desirable investment because it promises to generate 1.07 present value for each rupee invested, which is the highest among three alternatives.

Question 9:-A project requires an initial investment of Rs.3,25,000 and is expected to generate the following net cash inflows:

Year	**1**	**2**	**3**	**4**
Cash inflow after tax	Rs.1,95,000	Rs.1,80,000	Rs.1,60,000	Rs.1,55,000

Compute net present value (NPV) of the project if the minimum desired rate of return is 15%.

[2 marks]

a) Rs.1,28,768.73
b) Rs.1,74,493.21
c) Rs.1,55,675.82
d) Rs.1,64,254.34

Sol. The cash inflow generated by the project is uneven. Therefore, the present value would be computed for each year separately:

Present value (PV) factor for year 1= $1/(1+0.15)=0.86956$

Present value (PV) factor for year 2= $1/(1+0.15)^2=0.75614$

Present value (PV) factor for year 3= $1/(1+0.15)^3=0.657516$

Present value (PV) factor for year 4= $1/(1+0.15)^4=0.57175$

Year	**Present Value Factor for years**	**Net Cash Inflow**	**Present Value of Cash Inflow**
1	0.86956	1,95,000	1,69,564.2
2	0.75614	1,80,000	1,36,105.2
3	0.657516	1,60,000	1,05,202.56
4	0.57175	1,55,000	88,621.25

Total			**4,99,493.21**
Initial Investment required			**3,25,000**
Net Present Value of Project	(499493.21-325000 = **Rs. 1,74,493.21**)		

Question 10:-Assume there are two projects that a company is reviewing and investing Rs.7000 is not a problem to the company provided its gets the required return. Management must decide whether to move forward with one, none or both of the projects. The cash flow (Rs.) patterns for each project are as follows:

	Cash Flows after tax	
Years	**Project A**	**Project B**
Initial cost of project	5000	2000
CF 1	1700	400
CF 2	1900	700
CF 3	1600	500
CF 4	1500	400
CF 5	700	300

Using internal rate of return (IRR) determine which project the company should accept if the cost of capital of company is 10%.

[2 marks]

a) **Project A**
b) Project B
c) Both Project A & B will accept

Sol.

The IRR for each project must be calculated. This is through an iterative process, solving for IRR in the following equation:

$$\frac{CF\ 1}{(1+i)^1}+\frac{CF\ 2}{(1+i)^2}+\frac{CF\ 3}{(1+i)^3}+\frac{CF\ 4}{(1+i)^4}+\frac{CF\ 5}{(1+i)^5}-Cash\ outflow=0$$

For **<u>Project A</u>**:-

$$\frac{1700}{(1+i)^1}+\frac{1900}{(1+i)^2}+\frac{1600}{(1+i)^3}+\frac{1500}{(1+i)^4}+\frac{700}{(1+i)^5}-5000=0$$

On solving we get,

Internal rate of return (IRR) ,i = 16.61%

For **<u>Project B</u>**:-

$$\frac{400}{(1+i)^1}+\frac{700}{(1+i)^2}+\frac{500}{(1+i)^3}+\frac{400}{(1+i)^4}+\frac{300}{(1+i)^5}-2000=0$$

On solving we get,

Internal rate of return (IRR) ,i = 5.23%

If the company's cost of capital is 10%, management should proceed with Project A and reject Project B.