① From the following information calculate IRR

Intial Investment is Rs 32,000/-

Years	1	2	3
cash flows	16,000	14,000	12,000

sol:- Given Investment is 32,000

$\left(\frac{1}{1+\frac{10}{100}}\right)^1$

Year	cash Inflows	Discount Factor (10%)	present value
1	16000	0.909	14,544
2	14000	0.826	11,564
3	12000	0.751	9,012

TPVLDF = 35,120

- Invest ment = 32,000

NPV = 3,120

Year	cash Inflow	DF (20%)	Present value
1	16,000	0.833	13328
2	14,000	0.694	9716
3	12,000	0.578	6936

TPVHDF = 29980

- Investment = 32000

NPV = -2020

$$IRR = LDF + \left[\frac{TPVLDF - Investment}{TPVLDF - TPVHDF}\right] \times (HDF - LDF)$$

$$= 10 + \left[\frac{35120 - 32000}{35120 - 29980}\right] \times (20 - 10) \quad = 16.07\%$$

② From the following information calculate Pay-Back Period

Intial Investment - 70,000/-

Years	1	2	3	4	5
CF	10,000	20k	30k	45k	60k

Sol:-

Intial Investment = 70,000/.

Years	Cash-flows	cumilative Annual cashinflows.
1	10,000	10,000
2	20,000	30,000
3	30,000	60,000
4	45,000	1,05,000
5	60,000	1,65,000

$$\text{Payback period} = 3 \text{ years} + \left[\frac{\text{Inv} - \text{CuACF}}{\text{succeeding CF}}\right] * 12$$

$$= 3 \text{ years} + \left[\frac{70000 - 60000}{45000}\right] * 12$$

$$= 3 \text{ years } 2.6 \text{ Months.}$$

③ From the following, calculate ARR

Intial Investment is 4,00,000/- scrap value is 80,000/- working capital is 2,00,000/-

Years	1	2	3	4	5
cash flows	1,00,000	2,50,000	3,70,000	4,30,000	5,10,000

Sol:- Intial Investment = 4,00,000

Scrap value = 80,000

Working capital = 2,00,000

$$\text{Average Income} = \frac{100,000 + 2,50,000 + 3,70,000 + 4,30,000 + 5,10,000}{5}$$

$$= 3,32,000$$

$$\text{Average Investment} = \text{Scrap value} + \frac{1}{2}(\text{Investment} - \text{Scrap value}) + \text{additional working capital}$$

$$= 80,000 + \frac{1}{2}(4,00,000 - 80,000) + 2,00,000$$

$$= 4,40,000$$

$$\text{Average rate of return (ARR)} = \frac{\text{Avg. Income}}{\text{Avg. Investment}} * 100\ \%$$

$$= \frac{3,32,000}{4,40,000} \times 100$$

$$= 75.45\ \%$$

④ From the following information calculate NPV and profitability Index where the intial investment is Rs 9,00,000 /- and the discount rate is 10%.

Years	1	2	3
Cash Flows	3,00,000	5,00,000	6,00,000

Sol:- Intial Investment = 9,00,000

Discount rate = 10%

$$DF = \frac{1}{\left(1 + \frac{10}{100}\right)^n}$$

Year	cashFlows	Discount Factor	Present Valu
1	3,00,000	0.909	2,72,700
2	5,00,000	0.826	4,13,000
3	6,00,000	0.751	4,50,600

TPV = 11,36,300

- Inv - 9,00,000

NPV = 2,36,300

∴ Net present value NPV = 2,36,300

Profitability Index (NPVI) = $\frac{\text{Total Present value}}{\text{Investment}}$

= $\frac{11,36,300}{9,00,000}$

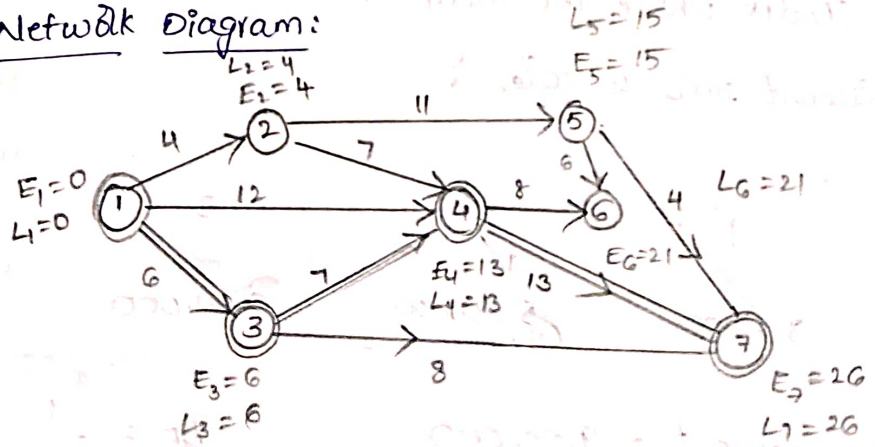
= 1.26256

Unit-IV

① Draw the Network Diagram and Evaluate PERT and CPM.

Activities	1-2	3-4	1-4	2-4	2-5	3-4	3-7	4-6	4-7	5-6	5
Time Duration	4	6	12	7	11	7	8	8	13	4	4

1) Network Diagram:



2) Critical path Method (CPM)

path-1 ⇒ 1 → 2 → 5 → 7, Time = 4+11+4 = 19

path-2 ⇒ 1 → 4 → 7 ; Time = 12+13 = 25

path-3 ⇒ 1 → 2 → 4 → 7, Time = 4+7+13 = 24

path-4 ⇒ 1 → 3 → 4 → 7, **Time = 6+7+13 = 26**

path-5 ⇒ 1 → 3 → 7 , Time = 6+8 = 14

3) Project Evaluation Review Technique (PERT)

I) Earlier Starting Time (EST) (Forward pass Method)

let $E_1 = 0$ (∵ no time taken)

$E_2 = E_1 + d_{12} = 0 + 4 = 4$

$E_3 = E_1 + d_{13} = 0 + 6 = 6$

$E_4 = \max(E_2 + d_{24}, E_1 + d_{14}, E_3 + d_{34})$

$= \max(4+7, 0+12, 6+7) = 13.$

$E_5 = E_2 + d_{25} = 4 + 11 = 15$

$E_6 = \max(E_5 + d_{56}, E_4 + d_{46}) = \max(15+6, 13+8) = 21$

$E_7 = \max(E_5 + d_{57}, E_4 + d_{47}, E_3 + d_{37})$

$= \max(19, 26, 14) = 26.$

$\therefore$ **$E_7 = 26$**

II) Backward pass Method (using Latest Ending Time)

let $L_7 = E_7 = 26$ $\quad L_6 = E_6 = 21$

$L_4 = \min(L_7 - d_{47}, L_6 - d_{46})$

$= \min(26 - 13, 21 - 8)$

$= \min(13, 13)$

$= 13.$

$L_3 = \min(L_4 - L_{34}, L_7 - d_{37})$

$= \min(13 - 7, 26 - 8) = 6$

$L_5 = \min(L_7 - d_{57}; L_6 - d_{56})$

$= \min(26 - 4, 21 - 6) = 15$

$L_2 = \min(L_5 - d_{25}, L_4 - d_{24})$

$= \min(15 - 11, 13 - 7) = 4$

$L_1 = \min(L_2 - d_{12}, L_3 - d_{13})$

$= \min(4 - 4, 6 - 6) = 0.$

By PERT & CPM, Expected project length will be 26 (days/wee