

12a) Maximize $Z = 2 X_1 + 3 X_2 + 4 X_3$
 $3 X_1 + 1 X_2 + 6 X_3 \leq 600$
 $2 X_1 + 4 X_2 + 2 X_3 \geq 480$
 $2 X_1 + 3 X_2 + 3 X_3 = 540$
 $X_1, X_2, X_3 \geq 0$

(16)

Solve the above LP problem using Two phase simplex method

OR

12 b) Find the optimal transportation cost of the following matrix using least cost method (16)

	A	B	C	D	E	Available
Factory P	4	1	2	6	9	150
Factory Q	6	4	3	4	5	170
Factory R	5	2	6	3	8	170
Demand	90	75	95	115	115	

13 a) Maximize $Z = X_1 + X_2$

ST

$$7X_1 - 5X_2 \leq 7$$

$$-12X_1 + 15X_2 \leq 7$$

$$X_1, X_2 \geq 0 \text{ and integer}$$

Solve the above LPP

OR

13 b) Maximize $Z = X_1 + X_2$

ST

$$7X_1 - 5X_2 \leq 7$$

$$-12X_1 + 15X_2 \leq 7$$

$$X_1, X_2 \geq 0 \text{ and integer}$$

Solve the above LPP

14 a) Consider the details of a distance network as shown below

(16)

Arc	1-2	1-3	1-4	2-3	2-5	3-4	3-5	3-6	3-7
Distance	6	7	10	8	4	6	11	3	5

Arc	4-7	5-6	5-8	6-7	6-8	6-9	6-10	7-9	8-10	9-10
Distance	7	13	9	5	4	8	3	10	10	9

a) construct the distance network

b) find the minimum spanning tree using PRIM algorithm

OR

14 b) Consider the data of a project as shown in table

Activity	Normal time (weeks)	Normal cost(Rs.)	Crash time (weeks)	Crash Cost(Rs.)
1-2	15	500	11	900
1-3	6	800	3	560
1-4	9	800	5	910
2-5	16	850	12	865
3-2	8	1120	5	1230
3-4	6	1200	3	1380
4-5	13	1600	8	1850

If the indirect cost per week is 300 find the optimal, normal and minimum project completion time.

15 a) An organization is planning to diversify its business with maximum outlay of Rs 4 crores. It has identified three different locations to install plants. The organization can invest in one or more of these plants subject to the availability of the fund. The different possible alternatives and their investments (in crores of rupees) and present worth of returns during the useful life (in crores of rupees) of each of these plants are summarized in the following table. The first row of the table has zero cost and zero return for all the plants. Hence, it is known as do-nothing alternative. Find the optimal allocation of the capital to different plants which will maximize the corresponding sum of the present worth of returns

Alternatives	Plant 1		Plant 2		Plant 3	
	Cost	Return	Cost	Return	Cost	Return
1	0	0	0	0	1	5
2	1	15	2	18	2	10
3	2	16	3	21	3	14
4	3	21	4	26	-	-

OR

15 b) An electronic item has three components in series. So, the reliability of the system is equal to the product of the reliabilities of the three components ($R = r_1 r_2 r_3$). It is known fact that the reliability of the system can be improved by providing standby units at extra cost. The details of costs and reliabilities for different number of standby units for each of the components of the system are summarized in the following table.

No. of standby units	Component 1		Component 2		Component 3	
	Cost (Rs.)	Reliability	Cost (Rs.)	Reliability	Cost (Rs.)	Reliability
1	100	0.70	300	0.85	200	0.85
2	200	0.85	400	0.95	300	0.92
3	300	0.95	600	0.98	500	0.97

The total capital budgeted for this purpose is Rs 800. Determine the optimum number of standby units for each of the components of the system such that the total reliability of the system is maximized.