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B.E/B.Tech. (Full Time) DEGREE END SEMESTER EXAMINATION NOV/DEC, 2011

INDUSTRIAL ENGINEERING BRANCH

III- SEMESTER- (REGULATION 2004)

IE 281- DETERMINISTIC OPERATIONS RESEARCH

Time : 3 hours

Max. Marks. 100

Answer All Questions

PART 'A' (10 x 2 = 20 Mark)

1. When it is possible to get multiple solution in LPP
2. Define feasible region
3. What is balance transportation problem
4. Name different methods to find the initial transportation cost .
5. Write any two difference between CPM and PERT
6. In network diagram ,what is a dummy activity
7. What are the cost involved in inventory
8. Define Lead time
9. What is dynamic programming
10. Define stages and state variables

PART -B(5 x 16 = 80 Marks)

11. An advertising firm desires to reach two types of audiences customers with annual income of more than Rs.40,000 (target audience A) and customers with annual income of less than Rs. 40,000 (target audience B). The total advertising budget is Rs 2,00,000. One programme of T.V advertising costs Rs 50,000 and one programme of Radio advertising costs Rs20,000 . Contract conditions ordinarily require that there should be at least 3 programmes on T.V and the number of programmes on Radio must not exceed 5. Survey indicates that a single T.V. programme reaches 7,50,000 customers in target audience A and 1,50,000 in target audience B. One radio programme reaches 40,000 customers in target audience A and 2,60,000 in target audience B.

Formulate this as a linear programming problem and determine the media mix to maximize the total reach using graphical method.

12 a) 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	100
Factory Q	6	4	3	5	7	120
Factory R	5	2	6	4	8	120
Demand	40	50	70	90	90	

OR

12 b) Four different jobs can be done on four different machines and take down time costs are prohibitively high for change overs. The matrix below gives the cost in Rupees of producing job i on machine j.

Jobs	Machine			
	M ₁	M ₂	M ₃	M ₄
J ₁	5	7	11	6
J ₂	8	5	9	6
J ₃	4	7	10	7
J ₄	10	4	8	3

How the jobs should be assigned to the various machines so that the total cost is minimized

13 a) 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	13	700	9	900
1-3	5	400	4	460
1-4	7	600	4	810
2-5	12	800	11	865
3-2	6	900	4	1130
3-4	5	1000	3	1180
4-5	9	1500	6	1800

If the indirect cost per week is RS160, find the optimal crashed project completion time..

OR

13 b) Consider the details of a distance network as shown below

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	9-107
Distance	7	13	9	5	4	8	3	10	10	9

- a) construct the distance network (8)
 b) find the minimum spanning tree using PRIM algorithm (8)

14a The demand rate for an item in a company is 12000units per year. The company can produce at the rate of 2000/month . The set up cost Rs.600 per order and the holding cost is Rs. 0.25 per unit per month. Calculate

- i) The optimum manufacturing quantity
- 2) The maximum inventory
- 3) The time between order
- 4) The number of order per year
- 5) The time of manufacture
- 6) The optimum annual cost is Rs 4/unit

OR

14 b) Find the optimum order quantity for a product for which the price breaks are as follows

Order Quantity	Unit cost (Rs.)
$0 < Q_1 < 100$	20.00
$100 \leq Q_2 < 200$	18.00
$200 \leq Q_3$	16.00

The monthly demand for the product is 400 units. The storage cost is 20% of the unit cost of the product per month and the cost of ordering is Rs25/month.

15a) An organization is planning to diversify its business with maximum outlay of Rs 14 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	10	10	10	10	10	10
2	11	22	12	26	12	19
3	12	25	13	30	113	22
4	13	29	14	35	-	-

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 stand by 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.