Code No: NR311303 **NR**

III B.Tech I Semester Supplementary Examinations, November 2006
OPERATIONS RESEARCH
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write the dual of the following LPP:
Minimize $Z = 3X_1+5X_2+6X_3$
Subject to
$X_1+4X_2+6X_3 \leq 5$
$2X_1+3X_2+5X_3 \geq 4$
$3X_1+X_2+7X_3=3$
and $X_1, X_2, X_3 \geq 0$

(b) Use penalty(Big M) method to maximize $Z=3X_1-X_2$
Subject to the constraints
$X_1X_2 \geq 2$
$X_1+3X_2 \leq 3$
$X_2 \leq 4$ and $X_1, X_2 \geq 0$ [4+12]

2. (a) Distinguish between a transportation problem and an assignment problem.

(b) Solve the following transportation problem with transportation cost, demand and supplies as given below. [4+12]

Ware House

		W1	W2	W3	W4	Demand
Factory	F1	19	30	50	10	7
	F2	70	30	40	60	9
	F3	40	8	70	20	18
Supply		5	8	7	14	

3. (a) Four salesman are to be assigned to four districts. Estimates of the sales revenue in thousand of Rupees for each salesman are as under: [8+8]

Salesman/Districts	A	B	C	D
1	32	35	40	28
2	40	25	30	22
3	42	27	34	30
4	25	39	41	35

(b) Find the sequence that minimizes the total elapsed time required to complete the following jobs.

Processing time	1	2	3	4	5
A_i	2	5	4	3	2
B_i	6	8	1	2	3

4. There are 1000 bulbs in the system. Survival rate is given below

Week	0	1	2	3	4
Bulbs in operation at the end of the week	1000	850	500	200	00

The group replacement of 100 bulbs costs Rs.1000 and individual replacement is Rs.20 per bulb. Suggest suitable replacement policy. [16]

5. (a) what is game theory? List out the various approaches in solving for strategies and game values.

   (b) Consider the game

		B		
		1	2	3
A	1	5	50	50
	2	1	1	0.1
	3	10	1	10

   Verify that the strategies (1/6,0,5/6) for player A and (49/54,5/54,0) for B are optimal and find the value of the game. [6+10]

6. A technician who repairs mobile phones finds that the time spent on a mobile set has an exponential distribution with mean 30 minutes. If the mobiles are repaired in order in which they come in and arrival is approximately Poisson with an average rate of 20 for 10 hours a day, what is the technician's expected idle time each day? How many jobs are ahead of the average set just brought in? [16]

7. (a) Derive the Economic Order Quantity Formula with instantaneous replenishment when shortages are allowed.

   (b) Given the following data for an item of uniform demand, instantaneous delivery time and Back order facility.
   Annual demand = 900 units, cost of an item = Rs. 50/-, Ordering cost = Rs. 900/-, Inventory carrying cost = 30%, Back order cost = Rs. 15. Find out

   i. Minimum cost order quantity
   ii. Maximum number of back orders
   iii. Maximum Inventory level
   iv. Time between orders
   v. Total annual cost. [8+8]

8. Solve the following model of the optimal subdividing of a cable of length 10 units into three parts such that the product of their lengths is maximized, using dynamic programming technique.
   Maximize Z = $p_1 X p_2 X p_3$
   Subjected to $p_1 + p_2 + p_3 = 10$; $p_1, p_2$and $p_3 \geq 0$ [16]

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