

III B.Tech I Semester Regular Examinations, November 2008
OPERATIONS RESEARCH
 (Electronics & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
 All Questions carry equal marks

1. (a) What are artificial variables? Why do we need them?
 (b) Solve the following LP Problem by two phase method
 Maximize $Z = 2x_1 + 3x_2 + 5x_3$
 subject to the constraints

$$3x_1 + 10x_2 + 5x_3 \leq 15$$

$$x_1 + 2x_2 + x_3 \geq 4$$

$$3x_1 - 10x_2 + 9x_3 \leq 3$$

$$x_1, x_2, x_3 \geq 0.$$

[6+10]

2. (a) Explain the Hungarian method to solve an assignment problem.
 (b) Suggest optimum assignment of 4 workers A, B, C and D to 4 jobs, I, II, III and IV. The time taken by different workers in completing the different jobs is given in table 2b. [6+10]

		Job			
		I	II	III	IV
Worker	A	5	5	-	2
	B	7	4	2	3
	C	9	3	5	-
	D	7	2	6	7

table 2b

3. (a) Explain the replacement strategy for items of low cost which fail suddenly.
 (b) The following failure rates have been observed for a certain type of light bulb.

End of Week :	1	2	3	4	5	6	7	8
Probability of failure :	0.05	0.13	0.25	0.43	0.68	0.88	0.96	1.00

The cost of replacing an individual bulb is Rs. 2.25. The decision is made to replace all bulbs simultaneously at fixed intervals, and also to replace individual bulbs as they fail in service. If the cost of group replacement is 60 paise per bulb and the total number of bulbs is 1,000, what is the best interval between group replacements? [6+10]

4. (a) Game theory provides a systematic quantitative approach for analyzing competitive situations in which the competitors make use of logical processes and techniques in order to determine an optimal strategy for winning: Comment.

- (b) Define :
- i. Competitive Game,
 - ii. Payoff matrix,
 - iii. Pure and mixed strategies,
 - iv. Saddle point,
 - v. Optimal strategies and
 - vi. Rectangular game. [8+8]
5. A library wants to improve its service facilities in terms of the waiting time of its borrowers. The library has two counters at present and borrowers arrive according to Poisson distribution with arrival rate 1 every 6 minutes and service time follows exponential distribution with a mean of 10 minutes. The library has relaxed its membership rules and a substantial increase in the number of borrowers is expected. Find the number of additional counters to be provided if the arrival rate is expected to be twice the present value and the average waiting time of the borrower must be limited to half the present value. [16]
6. Find the most economic batch quantity of a product on a machine of the production rate of the item on the machine with 200 pieces/day and the demand is uniform at the rate of 100 pieces/day. The set-up cost is Rs.200 per batch and the cost of holding one item in inventory is Rs.0.81 per day. How will the batch quantity vary if the machine production rate was infinite? [16]
7. Seven units of capital can be invested in four activities with the return from each activity given in the accompanying table. Find the allocation of capital to each activity that will maximize the total return. [16]

Q	$g^1(Q)$	$g^2(Q)$	$g^3(Q)$	$g^4(Q)$
0	0	0	0	0
1	2	3	2	1
2	4	5	3	3
3	6	7	4	5
4	7	9	5	6
5	8	10	5	7
6	9	11	5	8
7	9	12	8	8

8. An automatic machinery company received a different number of orders each day and the orders vary in the time required to process them. The firm is interested in determining how many machines it should have in the departments to minimize the combined cost of machine idle time and order waiting time. The firm knows from past experience the average number of orders per day and the average number of hours per order, which are as follows:

Code No: R05311302

Set No. 1

Number of Orders/Day	Probability	Hours/Order	Probability
0	0.10	5	0.05
1	0.15	10	0.05
2	0.25	15	0.10
3	0.30	20	0.10
4	0.15	25	0.20
5	0.05	30	0.25
		35	0.15
		40	0.10

Cost/hour of idle machine time = Rs 4.00 Cost-hour for orders waiting = Rs 6.00
Assuming 24 hours working in three shifts, solve the problem using simulation.[16]
