Set No. 2

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
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1. Solve the following LPP by formulating its dual
   Minimize Z = $50x_1$ - $80x_2$ - $140x_3$
   Subjected to

   x_1 - x_2 - $x_3 \geq 4$
   x_1 -$2x_2$ - $2x_3 \geq 3$
   and x_1, x_2, $x_3 \geq 0$.   [16]

2. (a) How can you maximize an objective function in the Assignment problem.

   (b) A hospital wants to purchase three different types of medical equipments and
       five manufacturers have come forward to supply one or all the three machines.
       However, the hospital?s policy is not to accept more than one machine from
       any one of the manufactures. The data relating to the price (in thousand of
       rupees) quoted by the different manufactures are as given in table 2b. Find
       the optimum assignment policy.   [4+12]

		Machines		
		1	2	3
	A	30	31	27
Subordinates	B	28	29	26
	C	29	30	28
	D	28	31	27
	E	31	29	26

table 2b

3. (a) The yearly cost of two machines A and B, when money value is neglected is
       shown below. Find their cost patterns if money is worth 10 per cent per year
       and hence find which machine is more economical.   [16]

Year :	1	2	3
Machine A (Rs) :	1,800	1,200	1,400
Machine B (Rs) :	2,800	1,200	1,400

   (b) Explain the term 'present worth factor'.   [10+6]

4. (a) Define saddle point and the value of game with examples.

   (b) Consider the game G with the following pay off matrix:

    i. Show that G is strictly determinable whatever μ may be.

    ii. Determine the value of G. $\hspace{4cm}$ [6+10]

Player B

Player A $\begin{bmatrix} 2 & 6 \\ -2 & -\mu \end{bmatrix}$

5. A bank has two tellers working on savings accounts. The first teller handles withdrawals only while the second teller handles deposits only. It has been found that the service time distribution for the deposits and withdrawals both are exponential with mean service time 3 minutes per customer. Depositors are found to arrive in a Poison fashion throughout the day containing 8 hours of working with mean arrival rate 16 per hour. Withdrawers also arrive in a Poisson fashion with mean arrival rate of 14 per hour.

    (a) What would be the effect on the average waiting time for depositors and withdrawers if each teller could handle both withdrawals and deposits?

    (b) What would be the effect if this could only be accomplished by increasing the service time to 35 minutes? $\hspace{3cm}$ [16]

6. Find the most economic batch quantity of a product on a machine of the production rate of the item on the machine is 300 pieces/day and the demand is uniform at the rate of 150 pieces/day. The set-up cost is Rs.300 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? $\hspace{3cm}$ [16]

7. A manufacturing firm producing refrigerators has given a contract to supply 50 units at the end of the first month, 50 at the end of the second month, and 50 at the end of the third. The cost of producing $'X'$ number of refrigerators in any month is given by X^2. The firm can produce more members of refrigerators in any month and carry them to the next month. However, a holding cost of Rs. 20 per unit is charged for any refrigerator carried over from month to the next. Assuming here is no initial inventory, determine the number of refrigerators to be produced in each month so as to minimize the total cost, using dynamic programming approach. $\hspace{2cm}$ [16]

8. A retail stiore distributes catalogues and takes orders by telephone. Distributions for intervals between incoming calls and the length of time required to complete each call are given below. The store management had derermined that they a caller will not have to wait longer than 10 seconds for the telephone to be answered. Use simulation to determine how many sales representatives should be available to answe incoming calls.

Interval Between Incoming calls (seconds)	Probability	Length of call (seconds)	Probability
10	0.08	60	0.07
12	0.11	65	0.12
14	0.14	70	0.18
16	0.16	75	0.16
18	0.14	80	0.15
20	0.12	85	0.12
22	0.08	90	0.08
24	0.07	95	0.06
26	0.04	100	0.06
28	0.04		
30	0.02		

[16]

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