Code No: R05311302 **Set No. 4**

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. (a) What is a model ? Discuss various types of models.
   (b) Discuss in brief the role of OR models in decision making process. [8+8]

2. Five workers are available to work with the machines and the respective costs (in rupees) associated with each worker - machine assignment are given in table 2. A 6^{th} machine is available to replace one of the existing ones and the associated costs are also given in the table.

Workers \ Machines	A	B	C	D	E	F
A	12	3	6	–	5	9
B	4	11	–	5	–	8
C	8	2	10	9	7	5
D	–	7	8	6	12	10
E	5	8	9	4	6	1

table 2

   (a) Determine whether the new machine can be accepted.
   (b) Also determine optimal assignment and the associated saving in cost. [16]

3. A scooter cost Rs 6,000 when new. The running cost and salvage value at the end of different years are as follows: (in Rs):

Year :	1	2	3	4	5	6	7
Running cost :	1,200	1,400	1,600	1,800	2,000	2,000	2,400
values:	4,000	2,666	2,000	1,500	1,000	600	600

   If the interest rate is 10 per cent per year and running costs are assumed to have occurred mid year, find when the scooter should be replaced. [16]

4. (a) State the rules for detecting a saddle point.

(b) Find the saddle point (or points) and hence solve the following game : [4+12]

$$A \begin{matrix} \\ \text{I} \\ \text{II} \\ \text{III} \end{matrix} \begin{matrix} \text{B} \\ \begin{bmatrix} \text{I} & \text{II} & \text{III} & \text{IV} \\ -5 & 2 & 1 & 20 \\ 5 & 5 & 4 & 6 \\ 4 & -2 & 0 & -5 \end{bmatrix} \end{matrix}$$

5. Arrival rate of telephone calls at a telephone booth is according to Poisson distribution, with an average time of 9 minutes between two consecutive arrivals. The length of telephone call is assumed to be exponentially distributed, with mean 3 minutes.

   (a) Determine the probability that a person arriving at the booth will have to wait.

   (b) Find the average queue length that forms during one hour.

   (c) The telephone company will install a second booth when convinced that an arrival would expect to have to wait at least four minutes for the phone. Find the increase in flow of arrivals which will justify a second booth.

   (d) What is the probability that an arrival will have to wait for more that 10 minutes before the phone is free? [16]

6. A baking company sells cake by weight. It makes a profit of 50 paise a kg on every pound sold on the day it is baked. It disposes of all cakes not sold on the day they are baked at a loss of 12 paise a kg. If the demand is known to be rectangular between 2,000 and 3,000 kgs, determine the optimum daily amount baked. [16]

7. Minimize $Z = a^2+b^2+c^2$,
   subject to $a + b + c = 10$
   when

   (a) a, b, c are non-negative,

   (b) a, b, c are non-negative integers. [16]

8. Discuss about phases of simulation explain with an example. [16]

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