Third Semester M.Sc. Degree Examination, November 2006
STATISTICS
Paper – 3.4 : Operations Research

Time: 3 Hours   Max. Marks: 70

Instructions : *Answer five questions without omitting any Unit. All questions carry equal marks.*

UNIT – I

1. a) Explain general linear programming problem. Stating important theorems explain the simplex algorithm in detail.

    b) Explain revised simplex method. In what way it is superior to ordinary simplex method ?

2. a) What is duality ? What is the significance of dual variables ? State duality theorems.

    b) What is an assignment problem ? Give its mathematical model. Give an algorithm to solve an assignment problem.

UNIT – II

3. a) What is meant by quadratic programming ? Derive the Kuhn - Tucker necessary conditions for an optimal solution to a quadratic programming problem.

    b) Explain the meaning of forward and backward recursion procedure in dynamic programming.

4. a) If $X \in E_3$, find the maximum and minimum values of 1×1^2 subject to the constraints

    $$g_1(x) = \frac{x_1^2}{4} + \frac{x_2^2}{5} + \frac{x_3^2}{25} - 1 = 0$$

    $$g_2(x) = x_1 + x_2 - x_3 = 0$$

    b) Use dynamic programming to show that $\sum\limits_{i=1}^{n} p_i \log p_i$ subject to the constraint $\sum\limits_{i=1}^{n} p_i = 1$ and $p_i > 0$ is minimum when all p_i's are equal to $\frac{1}{n}$.

UNIT – III

5. a) Describe M|M|I queueing model. Obtain the steady state probability distribution of the number of customers in the system.

   b) Explain the embedded Markov chain technique in M|G|I model and obtain the expected queue length in equilibrium.

6. a) Obtain the steady state solution for the M|M|C model. Obtain an expression for the average number of customers in this model.

   b) Write a critical note on Pollaczek - Khinchine formulas.

UNIT – IV

7. a) Explain clearly the various costs that are involved in inventory problems with suitable examples.

   b) Determine the optimal order quantity under the following assumptions :

      i) Demand rate is constant and known

      ii) Production rate is infinite

      iii) Lead time is constant

      iv) Purchase price per unit of the given item is constant.

      v) holding cost and ordering cost are known constant.

8. a) A baking company sells cake by kilogram weight. It makes a profit of Rs. 25 per kg. if the cake is sold on the day it is baked. It disposes of all cakes not sold on the date it is baked at a loss of Rs. 10 per kg. The demand is known to be rectangular between 2000 and 3000 kg. Developing the theoretical background, determine the optimal amount of cake baked.

   b) Write a critical note on (s, s) inventory policies.

UNIT – V

9. a) Establish the equivalence of matrix games and linear programming problem.

   b) Distinguish between individual and group replacement policies. Derive a criteria under which group replacement policy is advisable.

10. a) A small project is composed of seven activities whose time estimates are given below :

Activity	1 – 2	1 – 3	1 – 4	2 – 5	3 – 5	4 – 6	5 – 6
Optimistic time :	2	2	3	2	3	3	4
Most likely time :	2	5	3	2	6	6	7
Pessimistic time :	8	8	9	2	15	9	16

   i) Find the expected duration and variance for each activity.

   ii) What is the probability that the project will be completed at least three days earlier than expected ?

   b) What is Monte-Carlo simulation ? What are advantages and limitations of simulation models ?

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