M 11189

Third Semester M.Sc. Degree Examination, November 2005
STATISTICS
Paper – 3.4 : Operations Research
(2004 Admn.)

Time : 3 Hours Max. Marks : 70

***Instructions:** 1) Answer five questions without **omitting** any Unit.*
*2) **All** questions carry **equal** marks.*

UNIT – I

1. a) Prove that every basic feasible solution of an LPP is an extreme point of the convex set of feasible solutions.

   b) Prove that the optimum value of the primal (if it exists), is equal to the optimum value of the dual.

2. a) What are artificial variables ? What are its uses ? Describe the two-phase method of solving an LP problem with artificial variables.

   b) Describe a transportation problem and give a mathematical model for it. Indicate how will you test for optimality of the feasible solution of transportation problem.

UNIT – II

3. a) Define quadratic programming problem. Explain Wolfe's algorithm for solving a Quadratic Programming problem.

   b) Examine the question of computational economy in dynamic programming technique.

4. a) Minimise $f(x) = x_1^2 + x_2^2 + x_3^2$

   Subject to $x_1 + x_2 + 3x_3 - 2 = 0$

   $5x_1 + 2x_2 + x_3 - 5 = 0$

   b) Solve using dynamic programming technique :

   Minimise $\sum_{i=1}^{10} y_e^2$

   Subject to $\prod_{i=1}^{10} y_i = 8, \quad y_i > 0$

P.T.O.

UNIT – III

5. a) Describe a queueing model. Obtain the waiting time distribution for an M | M | 1 | FIFO queue.

   b) Obtain the Pollaczek-Khinchine formula for an M | G | I queue.

6. a) Describe an M | M | C queue. Obtain the stationary distribution of the number of customers in the system in an M | M | C model.

   b) Distinguish between Poisson and Non-Poisson queues. Outline the steady state results of M | E_K | I queues.

UNIT – IV

7. a) Determine an optimum production quantity for each production run and the optimal interval between successive runs under the following assumptions :

   i) Demand is uniform and known

   ii) Shortages are permitted

   iii) Production is instantaneous

   iv) Lead time is zero.

   b) Formulate and solve an inventory model with instantaneous stochastic demand with no set-up cost.

8. a) Derive the optimal economic lot size formula in the usual notations, when the rate of replenishment is finite.

   b) What do you mean by (s, s) inventory policy ? Obtain the optimal order quantity for an (s, s) model.

UNIT – V

9. a) For an m × n matrix game, show that both $\max_X \min_Y E(x, y)$ and $\min_Y \max_X E(x, y)$ exist and are equal.

   b) Describe the problem of replacement of items whose maintenance cost increase with time. (Assume that the value of money remains constant).

10. a) Calculate the total float, free float and independent float for the project whose activities are given below :

Activity	1 – 2	1 – 3	1 – 5	2 – 3	2 – 4	3 – 4	3 – 5	3 – 6	4 – 6	5 – 6
Duration (in weeks)	8	7	12	4	10	3	5	10	7	4

   b) Explain the basic steps in Monte-Carlo simulation. Briefly describe its application in the case of inventory problems.
