ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU -27
M.Sc. STATISTICS – III SEMESTER
SEMESTER EXAMINATION: OCTOBER 2022
(Examination conducted in December 2022)
STDE 9520: OPERATIONS RESEARCH

Time: 2 ½ Hours   **Max Marks: 70**

This paper contains TWO printed pages and TWO parts

Part A

I.   Answer any 6 questions. Each carries three marks.   3x6=18

1. Define Linear Programming Problem (LPP). Give the general form of LPP.
2. Define Assignment problem. When do say that it is unbalanced?
3. Explain the importance of artificial variables in solving a LPP by Simplex method.
4. Explain the mathematical formulation of a T.P.
5. What do you mean by transient and steady states in queueing theory?
6. Define holding cost, set-up cost and storage cost in Inventory theory.
7. Define the following terms:
      i.   Demand
      ii.   Lead time.
      iii. Deterministic inventory models.
8. Differentiate between pure integer programming and mixed integer programming with Illustration.

Part B

II.   Answer any 4 questions. Each carries thirteen marks.   13x4=52

9. A). A company manufactures two products X and Y. These products are processed in the same machine. It takes 30 minutes to process one unit of product X and 15 minutes of each unit of product Y and the machine operates for a maximum of 50hrs in a week. Product X requires 50kg and Y requires 25kg of raw material per unit, the supply of which is 700kg per week. Market constraints on Product Y is known to be a minimum of 800units every week. Product X costs Rs.50 per unit and sold at Rs.100. Product Y costs Rs.60 per unit and can be sold in the market at a unit price of Rs.80. Formulate the above as an LPP.   (5)
    B). Explain Simplex algorithm for finding optimal solution to the given LPP.   (8)
10. A). Define Degeneracy in T.P. How do you resolve it?   (4)
     B). Explain the algorithm of Hungarian to obtain optimal solution to the assignment problem.   (6)
     C). Distinguish between Transportation problem and Assignment problem.   (3)
11. A). Explain the Gomory's method of generating a cutting plane.   (7)
     B). Explain the various steps involved in solving integer linear programming.   (6)

12. A). Explain the steps to obtain the optimal order quantity for a quantity discount inventory model. (6)

B). Derive the Economic order quantity (EOQ) and total optimal cost for the Inventory model without the shortage. (7)

13. A). Distinguish between linear and non-linear integer programming. Give the mathematical formulation of linear integer programming. (3)

B). Define Queueing system. Briefly describe the characteristics of Queueing system. (6)

C). Explain the Kendall's notation for representing the Queueing models. (4)

14. A). What is quantity discount inventory model?

If annual demand for an item is 4800 units, ordering cost is Rs 300/- per order, inventory carrying cost is 40% of the purchase price per unit, obtain the optimal order quantity and optimal cost. Find the optimal order size and optimal cost. (7)

The price break is given below:

Quantity	Price (Rs)
$0 < Q < 1200$	10
$1200 \leq Q < 2000$	9
$Q \geq 2000$	8

B). Define deterministic queueing models. Briefly explain any four classification of Queueing models. (6)

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