LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **STATISTICS**

FOURTH SEMESTER – APRIL 2017

ST 4814- ADVANCED OPERATIONS RESEARCH

Date: 20-04-2017 Dept. No. Max. : 100 Marks
09:00-12:00

Section – A

Answer all the questions 10 X 2 = 20 marks

1. Define a general linear programming problem.
2. Write the dual of the following primal problem:
   Maximize $z = 5x_1 + 12x_2 + 4x_3$
   Subject to the constraints:
   $x_1 + 2x_2 + x_3 \leq 10$
   $2x_1 - x_2 + 3x_3 = 8$
   $x_1, x_2, x_3 \geq 0$.
3. Define a Quadratic Programming Problem.
4. Write the Kuhn-Tucker necessary conditions for the optimal solution of general non -linear Programming problem.
5. Define purchasing and holding costs in inventory control.
6. For a classic Economic Order Quantity(EOQ) model if K =\$100 , h = \$0.05 and D = 30 units / day and lead time is 30 days , find the optimal inventory policy and the associated cost per day.
7. Write the three assumptions in a probabilistic EOQ model.
8. Write a note on generalized Poisson queuing model.
9. How Branch and Bound method is used in solving Integer Programming Problem ?
10. Write about the types of simulation.

Section – B

Answer any five questions 5 X 8 = 40 marks

11. Solve the following linear programming problem graphically:
    Maximize $z = 2x_1 + 3x_2$
    Subject to the constraints:
    $x_1 + x_2 \leq 30$
    $x_1 - x_2 \geq 0$
    $x_2 \geq 3$
    $x_1 \leq 20$
    $x_2 \leq 12$
    $x_1 \geq 0$, $x_2 \geq 0$.
12. Explain Big-M algorithm in solving a linear programming problem.
13. Solve the following NLPP using Lagrange multipliers:
    Minimize $z = 2x_1^2 - 24x_1 + 2x_2^2 - 8x_2 + 2x_3^2 - 12x_3 + 200$
    subject to
    $x_1 + x_2 + x_3 = 11$
    $x_1 \geq 0$, $x_2 \geq 0$, $x_3 \geq 0$.
14. .Derive (M/M/1): (GD/∞/∞) queuing model.
15. Derive classic Economic Order Quantity model with one price break.

16. An item sells for \$25 a unit , but a 10% discount is offered for lots of 150 units or more. A company uses this item at the rate of 20 units per day. The setup cost for ordering a lot is \$50 and the holding cost per unit per day is \$.30.Should the company take advantage of the discount?

17. Use dynamic programming method to solve the following LPP:

Minimize $z = x_1^2 + 2x_2^2 + 4x_3$

subject to

$x_1 + 2x_2 + x_3 \geq 8$

$x_1 \geq 0 , x_2 \geq 0 , x_3 \geq 0.$

18. Explain the three methods of simulation.

Section-C

Answer any two questions $2 \times 20 = 40$ marks

19.(a) Explain dual simplex algorithm.

(b) Use duality to solve the following LPP:

Maximize $z = 2x_1 + x_2$

Subject to

$x_1 + 2x_2 \leq 10$

$x_1 + x_2 \leq 6$

$x_1 - x_2 \leq 2$

$x_1 - 2x_2 \leq 1$, $x_1 \geq 0 , x_2 \geq 0$ $(10 + 10)$ marks

20.Use Wolfe's method to solve the following QPP:

Maximize $z = 2x_1 + 3x_2 - 2x_1^2$

Subject to

$x_1 + 4x_2 \leq 4$

$x_1 + x_2 \leq 2$

$x_1 \geq 0 , x_2 \geq 0$

21.(a) Derive probabilistic economic order quantity model.

(b) Derive (M/M/C) : (GD/∞/∞) queuing model. (10 + 10) marks

22. Solve the following integer linear programming problem using the cutting- plane algorithm :

Maximize $z = 3x_1 + x_2 + 3x_3$

Subject to

$-x_1 + 2x_2 + x_3 \leq 4$

$4x_2 - 3x_3 \leq 2$

$x_1 - 3x_2 + 2x_3 \leq 3$

x_1, x_2, x_3 all are non-negative integers.

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