LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – STATISTICS

FOURTH SEMESTER – APRIL 2010

ST 4811 / 4807 - ADVANCED OPERATIONS RESEARCH

Date & Time: 20/04/2010 / 9:00 - 12:00 Dept. No. Max. : 100 Marks

PART-A

Answer all the questions. **10x2 = 20 marks**

1. State general linear programming problem.
2. Give an example for an LPP to have an unbounded solution.
3. Find the dual for the following primal :
   Maximize $z = 10x_1 - 4x_2 + 7x_3$
   Subject to
   $2x_1 + 5x_2 + 8x_3 \leq 12$
   $6x_1 - 4x_2 + 5x_3 \leq 34$
   $3x_1 + 6x_2 - 8x_3 \leq 55$
   $x_1 \geq 0$, $x_2 \geq 0$ and $x_3 \geq 0$.
4. Write a note on goal programming.
5. What is the need for inventory control ?
6. Define setup and penalty costs.
7. Write the general behavior of customers in a queue.
8. Write the characteristics of a queuing model.
9. State quadratic programming problem.
10. Write the significance of stochastic programming.

PART-B

Answer any five questions **5x8 = 40 marks**

11. Use the graphical method to solve the following LPP:
    Minimize $z = -x_1 + 2x_2$
    Subject to
    $-x_1 + 3x_2 \leq 10$, $x_1 + x_2 \leq 6$ and $x_1 - x_2 \leq 2$
    $x_1 \geq 0$ and $x_2 \geq 0$.
12. Discuss the dual simplex algorithm.
13. Explain the multiple item static model.
14. Explain the elements of a queuing system.
15. At a certain petrol pump , customers arrive in a Poisson process with an average time of 5 minutes between arrivals. The time interval between servers at the petrol pump follows an exponential distribution and the mean time taken to service a unit is 2 minutes.
    Find
    (i) Average number of customers in the system.
    (ii) Expected average queue length
    (iii) Average time a customer has to wait in the queue
    (iv) Average time a customer has to spend in the system.
16. Derive the sufficient conditions for a general NLPP with m(<n) constraints.

17. Explain the branch and bound algorithm for solving an IPP.
18. Use dynamic programming to solve the following problem:
    Minimize $z = y_1^2 + y_2^2 + y_3^2$
    Subject to
    $Y_1 + y_2 + y_3 \geq 15$ and y_1, y_2 and y_3 are non-negative.

PART-C

Answer any two questions **2x20 = 40 marks**

19. Solve the following integer linear programming problem using the cutting plane algorithm:
    Maximize $z = 3x_1 + x_2 + 3x_3$
    Subject to
    $-x_1 + 2x_2 + x_3 \leq 4$, $4x_2 - x_3 \leq 2$ and $x_1 - 3x_2 + 2x_3 \leq 3$
    x_1 , x_2 and x_3 all are non –negative integers.
20. Write in detail a continuous review inventory model when the demand is stochastic.
21. Derive the characteristics of (M/M/c) : (GD/N/∞) queuing model.
22. Use Wolfe's method to solve the following quadratic programming problem:
    Maximize $z = 6x_1 + 3x_2 - 4x_1x_2 - 2x_1^2 - 3x_2^2$
    Subject to
    $x_1 + x_2 \leq 1$ and $2x_1 + 3x_2 \leq 4$
    x_1 and x_2 are non-negative.
