 LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

**M.Sc.** DEGREE EXAMINATION - **STATISTICS**

FOURTH SEMESTER – APRIL 2012

# ST 4811 - ADVANCED OPERATIONS RESEARCH

Date : 20-04-2012 Dept. No. Max. : 100 Marks

Time : 1:00 - 4:00

**PART-A**

**Answer all the following: (10X2=20)**

1. When is a solution to an LPP called infeasible?
2. Define Pure Integer Programming Problem.
3. Define holding costs.
4. Write down the basic components of a queuing model.
5. Write down the significance of integer programming problem.
6. What do you mean by Non Linear Programming Problem?
7. Define Dynamic Programming Problems.
8. Define Stochastic programming.
9. Provide any two applications for parallel and sequence service systems.
10. An oil engine manufacturer purchases lubricants at the rate of Rs.42 per piece from a vendor.

The requirement of these lubricants is 1,800 per year. What should be the order quantity per

order, if the cost per placement of an order is Rs.16 and inventory carrying charge per rupee per

year is only 20 paise.

**PART B**

**Answer any FIVE of the following: (5 X 8 = 40)**

11) Use the graphical method to solve the following LPP:

Minimize Z = x1 + 0.5x2

Subject to the constraints:

3x1 + 2x2 ≤ 12 , 5x1≤ 10 x1+ x2 ≥ 8 , - x1+ x2 ≥ 4 , x1≥ 0 and x2 ≥ 0.

1. Write down the simplex algorithm.
2. Use duality to solve the following LPP:

Maximize Z = 2x1 + x2

Subject to the constraints:

x1 + 2x2 ≤ 10 , x1 + x2 ≤ 6 , x1 – x2 ≤ 2 , x1 – 2x­2 ≤ 1 ; x1,x2 ≥ 0 .

1. Write briefly about inventory management.
2. Explain Branch and Bound model for solving interger programming problem.
3. Write Wolfe’s algorithm to solve Quadratic Programming Problem.
4. Solve the following NLPP using lagrangian multiplier principle:

Z = x2 + y2 + z2

Subject to the constraints: x+ y + z = 1 , x, y , z ≥ 0

1. Explain the scope of simulation and its applications.

**PART – C**

**Answer any two questions: (2x 20 = 40)**

19.(a) Use two-phase simplex method to

Maximize Z = 5x1 - 4x2 + 3x3

Subject to the constraints:

2x1 + x2 -6x3 = 20 , 6x1 + 5x2 + 10x3 ≤ 76 , 8x1 - 3x2 +6x3 ≤ 50 ; x1, x2, x3 ≥ 0

(b) Explain the characteristics of dynamic programming problem. (12 + 8 )

20) Solve the following integer programming problem using Gomory’s constraints method:

Maximise Z = 7x1+ 9x2

Subject to –x1 + 3x2 ≤ 6, 7x­1+ x2 ≤ 35, x1 is a n integer and x2 ≥ 0

(20)

21) Use Wolfe’s method to solve the following QPP:

Maximize Z = 4x1 + 6x2 – 2x1x2 – 2x12 – 2x22

Subject to the constraints:

x1 + 2x2 ≤ 2 ; x1, x2 ≥ 0 . (20)

22) a) Derive the steady state differential equation for the model (M/M/1) : (GD/. (12)

b) The rate of arrival of customers at a public telephone booth follows Poisson distribution,

with an average time of 10 minutes between one customer and the next. The duration of a

phone call is assumed to follow exponential distribution, with mean time of 3 minutes.

1. What is the probability that a person arriving at the booth will have to wait?
2. What is the average length of the non-empty queues that form from time to time?
3. The Steve Telephone Nigam Ltd. will install a second booth when it is convinced that the customer would expect waiting for atleast 3 minutes for their turn to make a call. By how much time should the flow of customers increase in order to justify a second booth?
4. Estimate the fraction of a day that the phone will be in use. (8)

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