Printed Pages : 7 **MCA-315**

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 7312 Roll No. | | | | | | | | | | |

M. C. A.

(Semester-III) Theory Examination, 2011-12

COMPUTER BASED OPTIMIZATION TECHNIQUES

Time : 3 Hours] *[Total Marks : 100*

Note : This question paper contains three Sections. Section-A contains very short-answer type questions, Section-B medium-answer type questions and Section-C contains descriptive-answer type questions.

Section-A

Attempt *all* parts of this question. $2 \times 10 = 20$

1. (a) Define inventory. What are the various types of inventory?

   (b) What is Economic Order Quantity?

   (c) What do you mean by Linear Programming? Describe the limitations of L.P.

(d) What do you mean by sensitivity analysis?

(e) What is the degeneracy in L.P. problem?

(f) Describe briefly the main steps in the basic procedure of modified distribution method.

(g) Explain Dynamic Programming. State its applications.

(h) Enumerate the investment portfolio selection problem as a quadratic programming problem.

(i) What is Queueing Theory?

(j) Describe Poisson distribution.

Section-B

There are five questions in this section. Attempt any *three* questions. 10×3=30

2. Solve the L.P. problem :

Minimize : $Z = x_1 - 3x_2 + 2x_3$

Subject to the constraints :

$$3x_1 - x_2 + 3x_3 \le 7$$

$$-2x_1 + 4x_2 \le 12$$

$$-4x_1 + 3x_2 + 8x_3 \le 10$$

and $$x_1, x_2, x_3 \ge 0.$$

3. A factory needs 36,000 units annually of a component that cost Rs. 2 per unit. Cost of each order placing is Rs. 25 and inventory carrying cost is Rs. 10 per year.

   (i) Find the economic lot size and the total inventory cost.

   (ii) What is the time between placing of order?

4. State the assignment problem. Describe a method of drawing number of lines in the context of assignment problem. Name the method.

5. Use Wolfe's method to solve the quadratic programming problem :

   Maximize : $Z = 2x_1 + 3x_2 - 2x_1^2$

   Subject to the consraints :

   $$x_1 + 4x_2 \leq 4$$

   $$x_1 + x_2 \leq 4$$

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

6. Show that inter-arrival times are distributed exponentially, if arrival is a Poisson process.

Section-C

There are five questions in this section. Attempt *all* questions. $10 \times 5 = 50$

7. Attempt any one part :

   (a) Derive an inventory model with one price break and obtain the decision rules for finding optimal order quantity.

   (b) Describe the problem of inventory control, when the stochastic demand is uniform, production of commodity is instantaneous and lead time is negligible.

8. Attempt any one part :

   (a) A company makes two kinds of belts. Belt A is of high quality and belt B is of lower quality. The respective profits are Rs. 8 and Rs. 6 per belt. Each belt of type A requires twice as much time as belt of type B and if all belts were of type B, the company could make 1,000 belts per day. The supply of leather is sufficient for only 800 belts (both A and B combined). Belt A requires a fancy buckle and only 400 such buckles are available per day. Three are only 700 buckles a day available for type B. Determine the number of belts to be produced for each type so as to maximize profit. Formulate and solve the problem graphically.

(b) Use two phase simplex method to solve the problem :

Mnimize : $15/2x_1 - 3x_2$

Subject to the constraints :

$$3x_1 - x_2 - x_3 \geq 3$$

$$x_1 - x_2 + x_3 \geq 2$$

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

9. Attempt any one part :

(a) Explain the geometrical interpretation of Branch and Bound method by solving the following Integer Linear programming :

Maximize : $Z = x_1 + x_2$

Subject to the constraints :

$$3x_1 + 2x_2 \leq 12$$

$$x_2 \leq 2$$

$x_1, x_2 \geq 0$ and are integer.

(b) Determine an initial basic feasible solution to the transportation problem, where O_i and D_j represent ith origin and jth destination respectively.

	D_1	D_2	D_3	D_4	Supply
O_1	6	4	1	5	14
O_2	8	9	2	7	16
O_3	4	3	6	2	5
Demand	6	10	15	4	35

10. Attempt any one part :

(a) What is the dynamic recursive relation? State the 'principle of optimality' in dynamic programming and give a mathematical formulation of D.P.

(b) Use dynamic programming to solve the L.P.P. :

Maximize : $Z = x_1 + 9x_2$

Subject to the constraints :

$$2x_1 + x_2 \leq 25$$

$$x_2 \leq 11$$

$$x_1, x_2 \geq 0.$$

11. Attempt any one part :

(a) Derive the Poisson distribution formula.

(b) Arrival rate of telephone calls at a telephone booth is according to Poisson distribution, with an average time of 9 minutes two consecutive arrivals. The lengths of telephone calls is assumed to be exponentially distributed with mean 3 minutes.

(i) Determine the probability that a person arriving at the booth will have to wait.

(ii) Find the average queue length that forms time to time.

7312-7-5,500