(c) An orthodontist schedules patients for a routine checkup every 15 min. and limits the total number of patients to 10 a day. It takes 12 min. to examine the first patient but, because the dentist tires quickly, each subsequent examination takes 1 min. longer than the one before it. Determine the average time that a patient spends in the dentist's office, both waiting and being examined, assuming that each patient arrives precisely when scheduled.

5. Write short notes on any **two** of the following :— **(10×2=20)**

(a) Relationship between Primal and its Dual in LPP.

(b) Sensitivity analysis.

(c) Advantages and limitations of graphical method for solving LPP.

(d) Non-linear programming.

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

PAPER ID : 7312 **Roll No.** 0 9 0 3 9 1 4 0 8 5

M.C.A.

(SEM. III) ODD SEMESTER THEORY EXAMINATION 2010-11

COMPUTER BASED OPTIMIZATION TECHNIQUES

Time : 3 Hours *Total Marks : 100*

Note : (1) Attempt **all** questions.

(2) All questions carry equal marks.

1. Attempt any **two** parts of the following :— **(10×2=20)**

(a) What is meant by a mathematical model of real situation ? Discuss the importance of models in problem solving using optimization techniques.

(b) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that, when he starts production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for a year is Rs. 2 and the setup cost of a production run is Rs. 1800. How frequently should production run be made ?

(c) A trading company buys and sells 10,000 bottles of pain balm every year. The cost per bottle is Rs. 2/- and the company's cost of placing an order for the pain balm is Rs. 100/-. The company's standard annual rate of return on working captial funds is 15%. The cost for physical storage of the pain balm is fixed.

(i) Determine the optimal order quantity and inventory cycle duration for the pain balm.

(ii) How many orders should be placed each year ?

(iii) Find the total relevant annual inventory cost for the pain balm.

2. Attempt any **two** of the following :— **(10×2=20)**

(a) What is meant by linear programming problem ? What are the characteristics of linear programming problem ?

(b) Solve the following problem :

Maximize $Z = 3x_1 + 5x_2 + 4x_3$

subject to the constraints

$$2x_1 + 3x_2 \leq 8$$

$$2x_2 + 5x_3 \leq 10$$

$$3x_1 + 2x_2 + 4x_3 \leq 15$$

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

(c) Use Big-M method to maximize $Z = 3x_1 - x_2$

subject to the constraints

$$2x_1 + x_2 \geq 2$$

$$x_1 + 3x_2 \leq 3$$

$$x_2 \leq 4$$

and $x_1, x_2 \geq 0$.

3. Attempt any **two** of the following :— **(10×2=20)**

(a) Develop algorithm for north west corner method for solving transportation problem.

(b) Determine the optimum basic feasible solution to the following transportation problem :

From ↓	To A	B	C	Available
I	50	30	220	1
II	90	45	170	3
III	250	200	50	4
Required	4	2	2	

(c) Explain degeneracy in a transportation problem. How degeneracy is overcome ?

4. Attempt any **two** of the following :— **(10×2=20)**

(a) Discuss the basic characteristics of the 'Queueing Model'.

(b) Find the shortest path from vertex A to vertex B along arcs joining various vertices lying between A and B (Fig. shown below). Length of each path is given.