Roll No 0908CA143D17

MCA - 301

M.C.A. III Semester

Examination, December 2014

Computer Oriented Optimization Techniques

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each question are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Use graphical method to solve the L.P.P.:

Maximize $z = 2x_1 + 4x_2$ subject to the constraints:

$x_1 + 2x_2 \leq 5, x_1 + x_2 \leq 4; x_1, x_2 \geq 0$

b) Prove that the set of feasible solutions to an L.P.P. is a convex set.

c) Obtain the dual problem of the following primal problem:

Minimize $z = x_1 - 3x_2 - 2x_3$

subject to the constraints:

$3x_1 - x_2 + 2x_3 \leq 7$, $2x_1 - 4x_2 \geq 12$, $-4x_1 + 3x_2 + 8x_3 = 10$ and

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

d) Use simplex method to solve following L.P.P.:

maximize $z = 4x_1 + 10x_2$

subject to the constraints:

$2x_1 + x_2 \leq 50, 2x_1 + 5x_2 \leq 100, 2x_1 + 3x_2 \leq 90$ and $x_1, x_2 \geq 0$

OR

Find the optimum integer solution to the following L.P.P.

maximize $z = x_1 + 4x_2$ subject to the constraints.

$2x_1 + 4x_2 \leq 7, 5x_1 + 3x_2 \leq 15, x_1, x_2 \geq 0$ and are integers.

Unit - II

2. a) Explain graphical method to solve the 2-Job N machines sequencing problem with given technological ordering for each job.

b) Write the steps for solving a problem by dynamic programming approach.

c) Write the steps of vogel's Approximation method to solve a transportation problem for an initial solution.

d) Use vogel's Approximation method to obtain an initial basic feasible solution of transportation problem.

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	950

OR

A company wishes to assign 3 jobs to 3 machines in such a way that each job is assigned to some machine and no machine works on more than one job. The cost of assigning job i to machine j is given by the matrix below:

$$\textit{Cost matrix}: \begin{bmatrix} 8 & 7 & 6 \\ 5 & 7 & 8 \\ 6 & 8 & 7 \end{bmatrix}$$

Draw the associated network. Formulate the network LPP and find the minimum cost of making the assignment.

Unit - III

3. a) Construct the network diagram comprising activities B, C, ..., Q and N such that the following constraints are satisfied:

B < E, F; C < G, L; E, G < H; L, H < I; L < M; H < N; H < J; I, J < P; P < Q.

The notation X < Y means that the activity X must be finished before Y can begin.

b) Write the rules for construction of a network.

c) Write the difference between PERT and CPM.

d) A Project consists of a series of tasks labelled A, B, ..., H, I with the following relationships (W < X, Y means X and Y cannot start until W is completed; X, Y < W means W cannot start until both X and Y are completed). With this notation construct the network diagram having the following constraints

A < D, E; B, D < F; C < G ; B, G < H; F, G < I.

Find also the minimum time of completion of the project, when the time (in days) of completion of each task is as follows:

Task :	A	B	C	D	E	F	G	H	I
Time:	23	8	20	16	24	18	19	4	10

OR

A small project consists of 7 activities for which the relevant data are given below:

Activity	A	B	C	D	E	F	G
Preceding activities	-	-	-	A,B	A,B	C,D,E	C,D,E
Activity duration (in days)	4	7	6	5	7	6	5

i) Draw the network and find project completion time

ii) Calculate total float for each of the activities.

Unit - IV

4. a) *Explain* the important characteristics of queuing system.

b) Define transient state and steady-state in a queuing system.

c) A T.V. repairman finds that the time spent on his jobs has an exponential distribution with mean 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets is approximately Poisson with an average rate of 10 per 8-hour day, what is repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?

d) A supermarket has two girls serving at the counters. The customers arrive in a Poisson fashion at the rate of 12 per hour. The service time for each customer is exponential with mean 6 minutes. Find

i) The probability that an arriving customer has to wait for service,

ii) The average number of customers in the system,

iii) The average time spent by a customer in the supermarket.

OR

In a heavy machine shop, the overhead crane is 75% utilised. Time study observations gave the average slinging time as 10.5 minutes with a standard deviation of 8.8 minutes. What is the average calling rate for the services of the crane and what is the average delay in getting services? If the average service time is cut to 8.0 minutes with standard duration of 6.0 minutes, how much reduction will occur, on average, in the delay of getting served?

Unit - V

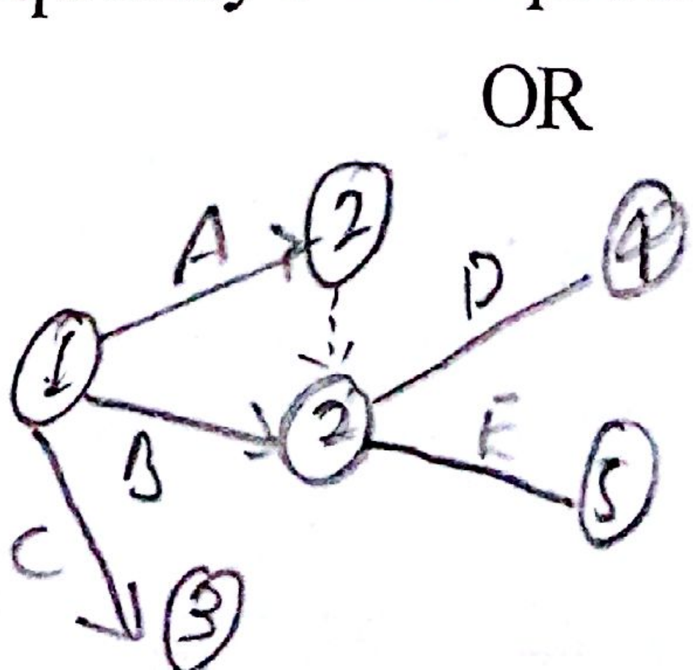
5. a) An oil engine manufacturer purchases lubricants at the rate of Rs. 42 per piece from a vender. The requirement of these lubricants is 1,800 per year. What should be the order quantity per order, if the cost per placement of an order is Rs. 16 and inventory carrying charge per rupee per year is only 20 paise.

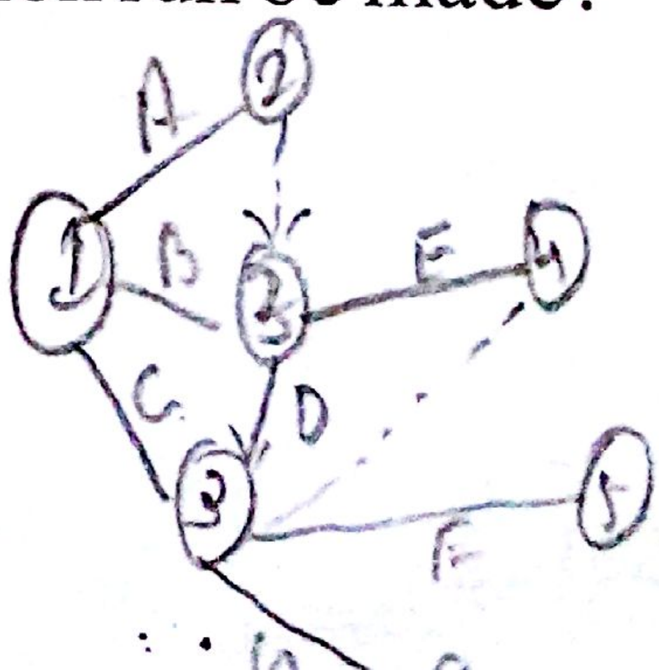
b) Describe Economic Order Quality (EOQ)

c) Neon lights in an industrial park are replaced at the rate of 100 units per day. The physical plant orders the neon lights periodically. It costs Rs. 100 to initiate a purchase order. A neon light kept in storage is estimated to cost about Rs. 02 per day. The lead time between placing and receiving an order is 12 days. Determine the optimum inventory policy for ordering the neon lights.

d) A contractor has to supply 10,000 bearings per day to an automobile manufacturer. He finds that, when he starts a production run, he can produce 25,000 bearings per day. The cost of holding a bearing in stock for one year is Rs. 2 and the set up cost of a production run is Rs. 18,000. How frequently should production run be made?

OR





Find the optimum order quantity for a product for which the price breaks are as follows:

Quantity	Purchasing cost per unit (Rs.)
$0 \leq Q_1 < 100$	20
$100 \leq Q_2 < 200$	18
$200 \leq Q_3$	16

The monthly demand for the product is 400 units. The storage cost is 20% of the unit cost of the product and the cost of ordering is Rs. 25.00 per month.

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