Roll No ....

MCA-301

M.C.A. III Semester

Examination, June 2020

Computer Oriented Optimization Techniques

Time : Three Hours

Maximum Marks : 70

Note: i)   Attempt any five questions.

ii)   All questions carry equal marks.

1. a)   Find the maximum value of $Z = 5x_1 + 7x_2$ subject to the constraints:

$x_1 + x_2 \leq 4$

$3x_1 + 8x_2 \leq 24$

$10x_1 + 7x_2 \leq 35$

$x_1, \ x_2 \geq 0.$

b)   Use Simplex method to solve the LPP:

Maximize $Z = 3x_1 + 2x_2$

subject to, $x_1 + x_2 \leq 4$

$x_1 - x_2 \leq 2$

$x_1, \ x_2 \geq 0.$

2. a)   Find the maximum of $Z = 6x + 8y$

subject to, $5x + 2y \leq 20$

$x + 2y \leq 10$

$x_1, y \geq 0.$

by solving its dual problem.

b)   Define O.R. and all models by function.

3. a) Determine an initial basic feasible solution to the following transportation problem using NWCR:

	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
Required	6	10	15	4	35

b) A company has 5 jobs to be done on five machines. Any job can be done on any machine. The cost of doing the jobs, on different machines are given below. Assign the jobs for different machines so as to minimize the total cost.

Jobs	Machines				
	A	B	C	D	E
1	13	8	16	18	19
2	9	15	24	9	12
3	12	9	4	4	4
4	6	12	10	8	13
5	15	17	18	12	20

4. a) Minimize $Z = Y_1^2 + Y_2^2 + Y_3^2$

subject to: $Y_1 + Y_2 + Y_3 \geq 15$

$Y_1, Y_2, Y_3 \geq 0$

b) Find the sequence that minimizes the total elapsed time (in hours) required to complete the following task on two machines :

Task	A	B	C	D	E	F	G	H	I
Machine I	2	5	4	9	6	8	7	5	4
Machine II	6	8	7	4	3	9	3	8	11

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5. a) Construct a network for the project where activities and precedence relationships are as given below:

Activities	A	B	C	D	E	F	G	H	I
Immediate predecessor	–	A	A	–	D	B, C, E	F	D	G, H

b) A project schedule has the following characteristics :

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (days)	4	1	1	1	6	5	4	8	1	2	5	7

From the above information, you are required to :

i) Construct a network diagram.

ii) Compute the earliest event time and latest event time.

iii) Determine the critical path and total project duration.

iv) Compute total and free float for each activity.

6. a) Define PERT procedure step by step .

b) Write a short note on CPM.

7. a) Explain Model I : (M/M/I) (∞/FCFS) (Birth and Death model).

b) In a railway marshalling yard, goods trains arrive at the rate of 30 trains per day . Assume that the inter arrival time follows an exponential distribution and the service time is also to be assumed as exponential with mean of 36 minutes. Calculate:

i) The probability that the yard is empty.

ii) The average queue length, assuming that the line capacity of the yard is nine trains.

8. a) Write a note on different types of inventory.

   b) The demand rate of a particular item is 12,000 units per year. The setup cost per run is ` 350 and the holding cost is ` 0.20 per unit, per month. If no shortages are allowed and the replacement is instantaneous, determine

   i) The optimal run size.

   ii) The optimal scheduling period.

   iii) Minimum total expected annual cost.

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