

Roll No

MCADD-405

M.C.A. (Integrated), IV Semester

Examination, June 2022

Computer Oriented Optimization Techniques

Time : Three Hours

Maximum Marks : 70

- Note:** i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) Describe what do you mean by operation research. Explain Linear Programming Model in detail.

b) Solve the following LPP using Simplex method:

$$\text{Maximize } Z = 5x_1 + 3x_2 + 7x_3$$

Subject to:

$$x_1 + x_2 + 2x_3 \leq 22$$

$$3x_1 + 2x_2 + x_3 \leq 26$$

$$x_1 + x_2 + x_3 \leq 18$$

$$x_1, x_2 \text{ and } x_3 \geq 0$$

2. a) Explain duality theory in linear programming and integer linear programming.

b) Solve the following LPP using dual simplex method:

$$\text{Minimize } Z = x_1 + x_2$$

Subject to:

$$2x_1 + x_2 \geq 2$$

$$-x_1 - x_2 \geq 1$$

$$x_1, x_2 \geq 0$$

3. a) Find an optimal solution to the transportation problem given below:

	Destinations				Supply
	D ₁	D ₂	D ₃	D ₄	
O ₁	5	2	4	3	22
O ₂	4	8	1	6	15
O ₃	4	6	7	5	08
Demand	07	12	17	09	

- b) Discuss the mathematical formulation of an assignment problem.
4. a) Write a short note on inventory control techniques.
- b) Define and explain the terms safety stock, lead time and EOQ with the help of ideal inventory model.
5. a) Distinguish between CPM and PERT.
- b) A small maintenance project consists of the following jobs whose precedence relationships is given below:

Jobs	1-2	1-3	2-3	2-5	3-4	3-6	4-5	4-6	5-6	6-7
Duration (days)	15	15	3	5	8	12	-	14	3	14

- i) Draw an arrow diagram.
- ii) Find the total float for each activity.
- iii) Find the critical float for path and the total project duration.

6. a) Obtain the steady state solution of the queueing model $(M|M|I) : (\infty | FCFS)$.
- b) If for a period of 2 hours in a day (08-10 a.m.) trains arrive at the yard every 20 minutes but the service time continues to remain 36 minutes. Then calculate for this period.
- i) The probability that yard is empty.
 - ii) Average queue length on the assumption that the line capacity of the yard is limited to 4 trains only.
7. a) Job arrival at a workstation in a manufacturing plant is in a Poisson fashion at an average rate of five per hour. The time to machine one job is an exponential distribution with a mean time of 20 minutes. What is the expected time a job has to wait at the workstation? What will be the average number of jobs waiting at the workstation at any time? What is the probability that there will be more than four jobs?
- b) Explain the following models in detail;
- i) $M/M/1:N/FCFS$
 - ii) $M/M/S:N/FCFS$
8. a) Determine the value of u_1, u_2, u_3 , so as to maximize (u_1, u_2, u_3) , subject to $u_1 + u_2 + u_3 = 10$ and $u_1, u_2, u_3 \geq 0$.
- b) What is the concept involved in the Gomory's cutting plane method?
