

Roll No

MCADD-405

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

Examination, November 2019

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) Consider the following transportation problem involving three sources and four destinations. The cell entries represent the cost of transportation per unit. Obtain the initial basic feasible solution using Vogel's approximation method.

		Destination				Supply
		1	2	3	4	
Source	1	3	1	7	4	300
	2	2	6	5	9	400
	3	8	3	3	2	500
Demand		250	350	400	200	1200

- b) State the Bellman's principle of optimality in dynamic programming and give a mathematical formulation of a dynamic programming problem.
4. a) Consider the following assignment problem. In this problem five different jobs are to be assigned to five different operators such that the total processing time is minimized. The matrix entries represent processing time in hours. Solve the problem using Hungarian Method.

		Operator				
		1	2	3	4	5
Job	1	10	12	15	12	8
	2	7	16	14	14	11
	3	13	14	7	9	9
	4	12	10	11	13	10
	5	8	13	15	11	15

- b) Describe Johnson's algorithm for processing n jobs through three or more machines in detail.

5. Following table summarizes the details of project involving 14 activities.

Project Details		
Activity	Immediate predecessor	Duration (Month)
A	-	2
B	-	6
C	-	4
D	B	3
E	A	6
F	A	8
G	B	3
H	C, D	7
I	C, D	2
J	E	5
K	F, G, H	4
L	F, G, H	3
M	I	13
N	J, K	7

Construct the CPM Network and determine the critical path and project completion time.

6. Following table summarizes the details of project involving 11 activities.

Project Details

Activity	Predecessor(s)	Duration (Weeks)		
		a	m	b
A	-	6	7	8
B	-	1	2	9
C	-	1	4	7
D	A	1	2	3
E	A, B	1	2	9
F	C	1	5	9
G	C	2	2	8
H	E, F	4	4	4
I	E, F	4	4	10
J	D, H	2	5	14
K	I, G	2	2	8

Construct the Project Network for PERT. Find the expected duration and variance of each activity. Find the critical path and expected project completion time.

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) Define the following inventory cost:

- i) Item cost
- ii) Set-up cost
- iii) Holding cost
- iv) Stock-out cost

b) If an annual demand of an item is 3200 unit. The unit cost is Rs. 6 and inventory carrying charge are 25 percent per annum. If the cost by one procurement is Rs. 150.

Determine:

- i) EOQ
- ii) Number of orders per year
- iii) Time between two consecutive orders
- iv) The optimal cost
