



K21P 2604

Reg. No. :

Name :

**V Semester M.C.A./M.C.A. (Lateral Entry) Degree (C.B.S.S. – Reg./Suppl./Imp.)
Examination, November 2021
(2016 Admission Onwards)**

Elective – III : MCA 5E09 : OPERATIONS RESEARCH

Time : 3 Hours

Max. Marks : 80

- Instructions :** 1) Answer **any ten** questions from Part – A. Each question carries 3 marks.
2) Answer **all** questions from Part – B. Each question carries 10 marks.

PART – A

Answer **any ten** questions. Each question carries 3 marks.

1. Distinguish between PERT and CPM.
2. What do you mean by queue discipline ? Explain various queue disciplines.
3. Explain Duality in LPP.
4. Explain any five applications of Linear Programming Problem.
5. Explain the various steps involved in solving a LPP by graphic method.
6. Briefly explain Branch and Bound technique in Integer Programming Problem.
7. What are the uses of Dynamic Programming ?
8. What are the assumptions in Sequencing Problem ?
9. Explain briefly Transportation problem.
10. What is network analysis ? When it is used ?
11. Define Unbalanced Assignment Problem. How are they solved ?
12. List the characteristics of a Markov Chain. **(10×3=30)**

P.T.O.



PART – B

Answer **all** questions. **Each** question carries **10** marks.

13. a) Solve the following by Two Phase Simplex Method :

$$\text{Minimize } Z = 6x_1 + 5x_2$$

$$\text{Subject to } 2x_1 + x_2 \geq 80, x_1 + 2x_2 \geq 60 \text{ and } x_1 \geq 0, x_2 \geq 0.$$

OR

- b) Solve the following by Big – M Method :

$$\text{Minimize } Z = 3x_1 + 8x_2$$

$$\text{Subject to } x_1 + x_2 = 200, x_1 \leq 80, x_2 \geq 60 \text{ and } x_1 \geq 0, x_2 \geq 0.$$

14. a) Solve the following transportation problem whose cost matrix availability at each plant and requirement at each warehouse are given as follows :

Plant	Warehouse				Availability
	W_1	W_2	W_3	W_4	
P_1	190	300	500	100	70
P_2	700	300	400	600	90
P_3	400	100	600	200	180
Requirement	50	80	70	140	

OR

- b) Use Dual Simplex Method to solve :

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

$$\text{Subject to } x_1 + x_2 \geq 1, 2x_1 + 3x_2 \geq 2 \text{ and } x_1 \geq 0, x_2 \geq 0.$$

- 15 a) Solve using Branch and Bound method :

$$\text{Maximize } Z = 2x_1 + 2x_2$$

$$\text{Subject to } 5x_1 + 3x_2 \leq 8, x_1 + 2x_2 \leq 4, \text{ and } x_1 \geq 0, x_2 \geq 0 \text{ and integers.}$$

OR

- b) By Dynamic programming technique, solve the problem :

$$\text{Minimize } Z = x_1^2 + x_2^2 + x_3^2$$

$$\text{Subject to } x_1 + x_2 + x_3 \geq 15, x_1, x_2, x_3 \geq 0.$$



16. a) A small maintenance project consists of the following 10 jobs. Draw network diagram (arrow diagram).

Calculate :

- 1) T_E and T_L values of all events.
- 2) EST, LST, EFT, LFT of all activities.
- 3) Floats of all the activities.

Also obtain :

- a) critical activities
- b) project duration.

Activity : 1-2 2-3 2-4 3-5 3-6 4-6 4-7 5-8 6-8 7-8

Duration : 4 6 10 8 2 12 4 15 14 8

OR

b) Solve the following sequencing problem :

Jobs	A	B	C	D	E	F
1	19	8	8	3	11	24
2	18	6	9	6	9	18
3	12	5	8	5	7	15
4	20	5	3	4	8	11

17. a) Customers arrive at a box office window, being manned by a single individual according to a Poisson input process with a mean rate of 30 per hour. The time required to serve a customer has an exponential distribution with a mean of 90 seconds. Find the average waiting time of a customer. Also determine the average number of customers in the system and average queue length.

OR

b) Use Bellman's principle of optimality to find the optimum solution :

Maximize $Z = x_1 \cdot x_2 \cdot x_3$

Subject to $x_1 + x_2 + x_3 = 5, x_1 \geq 0, x_2 \geq 0, x_3 \geq 0.$

(5x10=50)