Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER INTEGRATED M.C.A DEGREE EXAMINATION (R), DECEMBER 2022
(2020 SCHEME)

Course Code: **20IMCAT309**

Course Name: **Introduction to Operations Research**

Max. Marks: **60** **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Give any three characteristics of Operations Research.
2. What is linear programming problem?
3. Define artificial variables with an example.
4. Explain two phase method of solving LPP.
5. What are unbalanced transportation problems and how it is solved?
6. Explain north west corner rule for solving transportation problems.
7. Solve the game with payoff matrix $\begin{bmatrix} 6 & 2 \\ -1 & -4 \end{bmatrix}$
8. Define two person zero sum games.
9. Explain transient and steady state in queuing theory.
10. Define the term traffic intensity associated with queuing theory.

PART B

(Answer one full question from each module, each question carries 6 marks)

MODULE I

11. Solve the following LPP by graphical method (6)

$$\text{Maximize } Z = 3x_1 - 15x_2$$
$$\text{Subject to } x_1 + x_2 \leq 8$$
$$x_1 - 4x_2 \leq 8$$
$$x_1, x_2 \geq 0$$

OR

12. Solve the following LPP using simplex method (6)

$$\text{Maximize } Z = 5x_1 + 3x_2$$
$$\text{Subject to } x_1 + x_2 \leq 2$$
$$5x_1 + 2x_2 \leq 10$$
$$3x_1 + 8x_2 \leq 12$$
$$x_1, x_2 \geq 0$$

MODULE II

13. Solve by two phase method (6)

Minimize $Z = 6x_1 + 5x_2$

Subject to $2x_1 + x_2 \geq 80$

$x_1 + 2x_2 \geq 60$

$x_1, x_2 \geq 0$

OR

14. Form the dual of the following primal problem (6)

$$Maximize\ Z = 4x_1 + 10x_2 + 25x_3$$

Subject to $2x_1 + 4x_2 + 8x_3 \leq 25$

$4x_1 + 9x_2 + 8x_3 \leq 30$

$6x_1 + 8x_2 + 2x_3 \leq 40$

$x_1, x_2, x_3 \geq 0$

MODULE III

15. Determine the initial basic feasible solution of the following transportation problem by North west corner rule (6)

	D1	D2	D3	Supply
O1	2	7	4	5
O2	3	3	1	8
O3	5	4	7	7
O4	1	6	2	14
Demand	7	9	18	

OR

16. Solve the following Assignment problem. (6)

JOB/MAN	1	2	3	4	5
I	8	4	2	6	1
II	0	9	5	5	4
III	3	8	9	2	6
IV	4	3	1	0	3
V	9	5	8	9	5

MODULE IV

17. Solve the game with payoff matrix $\begin{bmatrix} 3 & 5 \\ 4 & 1 \end{bmatrix}$ (6)

OR

18. Solve the following game graphically (6)

		Player B				
		B1	B2	B3	B4	B5
Player A	A1	2	-4	6	-3	5
	A2	-3	4	-4	1	0

MODULE V

19. Explain the basic characteristics of a queuing model. (6)

OR

20. A supermarket has a single cashier. During peak hours, customers arrive at a rate of 20 per hour. The average number of customers that can be processed by the cashier is 24 per hour. Calculate (6)

1) The probability that the cashier is idle
2) The average number of customers in the queuing system
3) The average time a customer spends in the system.
4) The average number of customers in the queue.
5) The average time a customer spends in the queue

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