Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – May / June 2026

Date: 25-05-2026 **Time:** 01:00pm – 04:00pm

School: SOCSE	**Program:** B.Tech.	
Course Code: MAT3046	**Course Name:** Computational Optimization Methods	
Semester: VI	**Max Marks**:100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	14	14	24	14	10	24

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1	Define operations research.	2 Marks	L1	CO1
2	What is a linear programming problem?	2 Marks	L1	CO1
3	List any two applications of operational research.	2 Marks	L2	CO2
4	Convert the following Assignment Problem from maximization problem into minimization. A: 1→32, 2→40, 3→41, 4→22; B: 1→38, 2→24, 3→27, 4→38; C: 1→40, 2→28, 3→33, 4→41; D: 1→28, 2→21, 3→30, 4→36	2 Marks	L2	CO2
5	State difference between a feasible solution and a basic feasible solution.	2 Marks	L2	CO3
6	Convert the following unbalanced TP to balanced TP. I: A→1, B→3, C→9, Demand→40; II: A→2, B→5, C→10, Demand→30; Supply: A→25, B→35, C→40	2 Marks	L2	CO3
7	A project consists of a series of tasks labelled A, B, C, D, E with the following constraints A<D, C; B, D<E. Construct a network using this notation.	2 Marks	L2	CO4

8	State the difference between CPM and PERT?	2 Marks	L1	CO4
9	Distinguish between pure strategy and mixed strategy.	2 Marks	L2	CO6
10	Check whether the following game is strictly determinable or not? Player B Player A $\begin{bmatrix} 1 & 1 \\ 4 & -3 \end{bmatrix}$	2 Marks	L2	CO6

Part B

Answer the Questions. **Total Marks 80M**

11	Discuss the phases of operations research study. Give a real-life application of OR in industry.	10 Marks	L2	CO1
	Or			
12	Discuss the advantages and disadvantages of operations research in decision-making.	10 Marks	L2	CO1
13	A TV company has to decide on the number of 27' inch and 20'inch TV sets to be produced at one of its factories. Market research indicates that at most 50 TV sets (includes both 27' inch and 20'inch TV sets) can be sold per month. The maximum number of work hours available is 500 hours/month. A 27'inch TV requires 20 work hours and a 20'inch TV requires 10 work hours. Each 27'inch TV sold produces a profit of Rs.120. and 20'inch TV sold produces a Rs.80. A wholesaler agrees to purchase all the TV set produced if the number do not exceed the maximum indicated by market research. Solve the given LPP using graphical method.	10 Marks	L3	CO2
	Or			
14	a) Identify any three real life applications of LPP.	3 Marks	L2	CO2
	b) Solve by using graphical method to minimize $z = 20x + 10y$ subject to $x + 2y \le 40,\ 3x + y \ge 30,\ 4x + 3y \ge 60,\ x, y \ge 0$.	7 Marks	L3	CO2

15	Find a basic feasible solution to the following transportation problem using any two methods of your choice. Destination						10 Marks	L3	CO3
	Origin		D_1	D_2	D_3	D_4	Supply		
		O_1	11	13	17	14	250		
		O_2	16	18	14	10	300		
		O_3	21	24	13	10	400		
		Demand	200	225	275	250			
	Or								
16	What degeneracy in a transportation problem? Find an initial basic feasible solution to the following transportation problem using Vogel's approximation method.						10 Marks	L3	CO3

	I	II	III	IV	V	Availability
A	3	4	8	8	9	20
B	2	10	1	5	8	30
C	7	11	20	40	3	15
D	2	1	9	14	16	13

	Requirement	40	6	8	18	6				

17	A company is producing a single product and selling it through five agencies situated in the different cities. All of a sudden, there is a demand for the product in five more cities that do not have any agency of the company. The company is faced with the problem of deciding on how to assign the existing agencies to dispatch the product to the additional cities in such a way that the travelling distance is minimized. The distances (in km) between the surplus and the deficit cities are given in the following distance matrix: Surplus cities / Deficit cities I II III IV V A 160 130 175 190 200 B 135 120 130 160 175 C 140 110 155 170 185 D 50 50 80 80 110 E 55 35 70 80 105 Determine the optimum assignment schedule.	10 Marks	L3	CO3
	Or			
18	A travelling salesman has to visit 5 cities. He wishes to start from a particular city, visit each city once and then return to his starting point. cost of going from one city to another city shown below. You are required to find the least cost route. To / From: A B C D E A ∞ 4 10 14 2 B 12 ∞ 6 10 4 C 16 14 ∞ 8 14 D 24 8 12 ∞ 10 E 2 6 4 16 ∞	10 Marks	L3	CO3

19	A small maintenance project consists of the following jobs whose precedence relationships is given below. Job: 1-2 1-3 2-3 2-5 3-4 3-6 4-5 4-6 5-6 6-7 Duration in days: 15 15 3 5 8 12 1 14 3 14 **i)** Draw an arrow diagram representing the project. **ii)** Find the total float for each activity. **iii)** Find the critical path and the total project duration.	10 Marks	L3	CO4
	Or			
20	The following table shows the jobs of a network along with their time estimates. the time estimates are in days: Activity: 1-2 1-6 2-3 2-4 3-5 4-5 6-7 5-8 7-8 a: 1 2 2 2 7 5 5 3 8 m: 7 5 14 5 10 5 8 3 17 b: 13 14 26 8 19 17 29 9 32 i) Draw the project network.	10 Marks	L3	CO4

	ii) Find the critical path. iii) Find the expected duration and Variance of each activity. iv) Calculate the early and late occurrence for each event and the expected project length. v) Calculate the variance and standard deviations of project length.			

21	Find the sequence that minimizes the total elapsed time (in hours) required to complete the following tasks on two machine. Tasks | 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	10 Marks	L3	CO5
	Or			
22	Find the sequence that minimizes the total time required in performing the following jobs on three machines in the order ABC. Processing times (in hours) are given in the following table: Job | 1 | 2 | 3 | 4 | 5 Machine A | 5 | 7 | 6 | 9 | 5 Machine B | 2 | 1 | 4 | 5 | 3 Machine C | 3 | 7 | 5 | 6 | 7	10 Marks	L3	CO5

23	The following games have saddle point solutions. Determine the saddle point and optimum strategies for each player. **i)** Player A $\begin{matrix} \\ A_1 \\ A_2 \\ A_3 \\ A_4 \end{matrix}$ Player B $\begin{matrix} B_1 & B_2 & B_3 & B_4 & B_5 \\ -2 & 0 & 0 & 5 & 3 \\ 3 & 2 & 1 & 2 & 2 \\ -4 & -3 & 0 & -2 & 6 \\ 5 & 3 & -4 & 2 & -6 \end{matrix}$, ii) Player A $\begin{matrix} \\ A_1 \\ A_2 \\ A_3 \\ A_4 \end{matrix}$ Player B $\begin{matrix} B_1 & B_2 & B_3 & B_4 \\ 20 & 15 & 12 & 35 \\ 25 & 14 & 8 & 10 \\ 40 & 2 & 10 & 5 \\ -5 & 4 & 11 & 0 \end{matrix}$	10 Marks	L3	CO6
	Or			
24	Solve the following payoff matrices, determine the optimal strategies and the value of games. i) Player A $\begin{matrix} \\ \\ \end{matrix}$ Player B $\begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix}$ ii) Player A $\begin{matrix} \\ \\ \end{matrix}$ Player B $\begin{bmatrix} 4 & -4 \\ -4 & 4 \end{bmatrix}$	10 Marks	L3	CO6

25	Solve the following 2 X 3 game graphically. Player A $\begin{matrix} \\ \\ \end{matrix}$ Player B $\begin{bmatrix} 1 & 3 & 11 \\ 8 & 5 & 2 \end{bmatrix}$	10 Marks	L3	CO6
	Or			
26	Using the principle of dominance, solve the following game. Player A $\begin{matrix} \\ \\ \\ \end{matrix}$ Player B $\begin{bmatrix} 1 & 7 & 2 \\ 6 & 2 & 7 \\ 5 & 1 & 6 \end{bmatrix}$	10 Marks	L3	CO6