Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY 2025

Date: 24-05-2025 **Time:** 09:30 am – 12:30 pm

School: SOCSE	**Program:** B. TECH- CAI/CBC/CBD/CCS/CDV/CIT/COM/ CSD/CSE/CSG/ISE/IST	
Course Code :MAT2031	**Course Name:** OPTIMIZATION TECHNIQUES	
Semester: VI	**Max Marks:** 100	**Weightage:** 50%

CO - Levels	CO1	CO2	CO3	CO4
Marks	29	21	26	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	Convert the following Unbalanced TP to Balanced TP | | A | B | C | Demand | | I | 1 | 3 | 9 | 40 | | II | 2 | 5 | 10 | 30 | | Supply | 25 | 35 | 40 | |	2 marks	L1	CO1
2	Write the Standard form of the given LPP Maximize $Z= 2x_1-4x_2$ Subject To Constraints $5x_1 - 12x_2 \leq 75$, $6x_1 + 3x_2 \leq 40$, $x_1, x_2 \geq 0$	2 Marks	L1	CO2

3	Covert the following assignment problem from maximization problem into minimization 		A	B	C	D
1	32	38	40	28
2	40	24	28	21
3	41	27	33	30
4	22	38	41	36		2 Marks	L1	CO1
4	Define Slack and Surplus variables in Linear Programming Problem.	2 Marks	L1	CO2
5	In LPP, For Which Conditions Phase II can be applied.	2 Marks	L1	CO2
6	What are the 3 floats in CPM?	2 Marks	L1	CO3
7	Develop a network diagram for the project specified below: 	Activity	A	B	C	D	E	F	G	H	I
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Immediate Predecessor	-	-	-	A	A	B,D	C	B	F,G		2 Marks	L1	CO3
8	What is the condition for converting N Jobs 3 machine sequencing problem to N job 2 machine Sequencing Problem? and if condition satisfies then what is the conversion formula?	2 Marks	L1	CO3
9	What is a Strategy and Types of Strategies?	2 Marks	L1	CO4
10	Define strictly determinable game and fair game.	2 Marks	L1	CO4

Part B

Answer the Questions. Total Marks 80M

11.	a.	Determine Initial Basic Feasible solution by North West Corner rule Method and apply MODI method to find Optimum Basic feasible Solution. 			I	II	III	IV	Availability
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From	A	3	1	7	4	250
	B	2	6	5	9	350
	C	8	3	3	2	400
Requirement		200	300	350	150			10 Marks	L3	CO1
		Or				
12.		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		10 Marks	L3	CO1

surplus and the deficit cities are given in the following distance matrix:

deficit cities / surplus 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.

13.	a.	Solve the following games by using dominance property Player B $\begin{matrix}\text{Player A}\end{matrix}\begin{bmatrix}4 & 2 & 0 & 2 & 1 & 1\\ 4 & 3 & 1 & 3 & 2 & 2\\ 4 & 3 & 7 & -5 & 1 & 2\\ 4 & 3 & 4 & -1 & 2 & 2\\ 4 & 3 & 3 & -2 & 2 & 2\end{bmatrix}$	10 Marks	L3	CO4
		Or			
14.	a.	The following games have saddle point solutions. Determine the saddle point and optimum strategies for each player. a)Player A $\begin{matrix}\\A_1\\A_2\\A_3\\A_4\end{matrix}\begin{matrix}\text{Player B}\\B_1 \quad B_2 \quad B_3 \quad B_4 \quad B_5\end{matrix}\begin{bmatrix}-2 & 0 & 0 & 5 & 3\\ 3 & 2 & 1 & 2 & 2\\ -4 & -3 & 0 & -2 & 6\\ 5 & 3 & -4 & 2 & -6\end{bmatrix}$ b) Player A $\begin{matrix}\\A_1\\A_2\\A_3\\A_4\end{matrix}\begin{matrix}\text{Player B}\\B_1 \quad B_2 \quad B_3 \quad B_4\end{matrix}\begin{bmatrix}20 & 15 & 12 & 35\\ 25 & 14 & 8 & 10\\ 40 & 2 & 10 & 5\\ -5 & 4 & 11 & 0\end{bmatrix}$	10 Marks	L3	CO4

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15.	a.	Solve the following 6 X 2 game graphically. Player B $\begin{matrix}\text{Player A}\end{matrix}\begin{bmatrix}1 & -3\\ 3 & 5\\ -1 & 6\\ 4 & 1\\ 2 & 2\\ -5 & 0\end{bmatrix}$	10 Marks	L3	CO2
		Or			
16.	a.	Solve the following payoff matrices, determine the the optimal strategies and the value of games	10 Marks	L3	CO2

		a) Player A $\begin{matrix} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 5 & 1 \\ 3 & 4 \end{bmatrix} \end{matrix}$ b) Player A $\begin{matrix} & \text{Player B} \\ \text{Player A} & \begin{bmatrix} 4 & -4 \\ -4 & 4 \end{bmatrix} \end{matrix}$			

17.	a.	Find Initial Basic Feasible solution for the transportation methods using a) Least Cost Method b)Vogel's Approximation method.	15 Marks	L3	CO1

	D1	D2	D3	D4	Supply
O1	19	30	50	10	7
O2	70	32	40	60	9
O3	42	8	70	20	18
Demand	5	8	7	14	

Or

18.		A travelling salesman has to visit five cities. He wishes to start from a particular city, visit each city once and then return to his starting point. The travelling times for each city from a particular city is given below	15 Marks	L3	CO1

To / **From**	A	B	C	D	E
A	∞	5	8	4	5
B	5	∞	7	4	5
C	8	7	∞	8	6
D	4	4	8	∞	8
E	5	5	6	8	∞

What is the sequence of visits of the salesman so that the total travelling time is minimized?

19.	a.	Solve the following LPP by Two Phase Method Minimize $\boldsymbol{Z = \frac{15}{2}x_1 - 3x_2}$ Subjected to the constraints $\boldsymbol{3x_1 - x_2 - x_3 \geq 3}$ $\boldsymbol{x_1 - x_2 + x_3 \geq 2}$ and $x_1, x_2 \geq 0$.	15 Marks	L3	CO2

Or

20.	a.	Use penalty method or Big M method to solve Linear Programming Problem Maximize $Z = x_1 + 2x_2$ Subject to $x_1 - x_2 \geq 3$ $2x_1 - x_2 \leq 10$ and $x_1, x_2 \geq 0$.	15 Marks	L3	CO2

21.	a.	The following table shows the jobs of network along with their time estimates.	12 Marks	L3	CO 3

Activity	1-2	1-6	2-3	2-4	3-5	4-5	6-7	5-8	7-8
Optimistic (days)	1	2	2	2	7	5	5	3	8
Most likely (days)	7	5	14	5	10	5	8	3	17
Pessimistic (days)	13	14	26	8	19	17	29	9	32

(a) Draw the Project network.
(b) Find the expected duration and variance of each activity.
(c) Find the Critical path and total duration of the project.
(d) Calculate the Variance and standard deviation of project length.
(e) Find the probability that the project is completed in 40 days.
$[\phi(0.8) = 0.2881]$

	b.	Find the sequence that minimizes the total elapsed time (in hours) required to complete the following tasks on two machine.	8Marks	L3	CO 3

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

Or

22.	a.	A project schedule has the following characteristics	12 Marks	L3	CO 3

Activity	1-2	1-3	2-4	3-4	3-5	4-9	5-6	5-7	6-8	7-8	8-10	9-10
Time (days)	4	1	1	1	6	5	4	8	1	2	5	7

(a) Draw an arrow diagram representing the project.
(b) Find the total float for each activity.
(c) Find the critical path and the total project duration.

	b.	A readymade garments manufacturer has to process items through two stages of production namely cutting, sewing and Packing. The time taken for each of these at the different stages are given below appropriate units. Determine the sequence that minimize the total elapsed time.	8Marks	L3s	CO3

Item	1	2	3	4	5	6	7
Cutting	5	7	3	4	6	7	12
Sewing	2	6	7	5	9	5	8
Packing	10	12	11	13	12	10	11

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