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PRESIDENCY UNIVERSITY

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Bengaluru

Mid Term Examinations - October 2026

Date: 05/10/2026 **Time:** 11:45 AM - 01:15 PM

Course Code: MAT1211 **Course Name:** Linear Algebra, Differential Equations and Statistical Methods

Semester: First Semester **Max. Marks:** 50 **Weightage:** 50%

CO - Levels	CO1	CO2	CO3
Marks	44	48	88

PART A: Answer Following Questions. 10 M

Q.N.	Questions	M	CO	BT
1	State the condition for the system of equations to have infinite solutions.	2	CO1	BT1
2	Compute the characteristic equation of the matrix $E = \begin{bmatrix} 2 & 1 \\ 0 & 3 \end{bmatrix}$	2	CO2	BT2
3	Describe the symmetric matrix associated with the quadratic form $8x_1^2 + 7x_2^2 + 3x_3^2 - 12x_1x_2 + 4x_1x_3 - 8x_2x_3.$	2	CO2	BT2
4	State Cauchy's mean value theorem.	2	CO3	BT1
5	Compute the value of the following $\lim_{x \to 0} \frac{sinx}{x}$	2	CO3	BT2

PART B : Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
6	Solve the system of equations using Gauss elimination method $x + 2y + z = 3,\ 2x + 3y + 3z = 10,\ 3x - y + 2z = 13.$	10	CO1	BT3
7	A city traffic engineer analyzed the traffic flow represented by x, y, z through three major connecting roads A, road B, road C respectively during the morning peak hours. Based on traffic observations the modeled equations are $2x + 3y - z = 5,\ 4x + 4y - 3z = 3,\ 2x - 3y + 2z = 2.$ Determine the traffic flow along x, y, z using Gauss elimination method.	10	CO1	BT3

PART C: Answer Any 1 Following Questions. 10 M

Q.N.	Questions	M	CO	BT
8	Use orthogonal reduction and reduce the following matrix to diagonal form $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	10	CO2	BT3
9	Apply orthogonal reduction and reduce the following matrix to diagonal form $B = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 5 & 1 \\ 3 & 1 & 1 \end{bmatrix}$	10	CO2	BT3

PART D: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
10	a) Determine the time at which the network traffic temporarily stops changing, for the network traffic in a server modelled by $N(t) = t^2 - 6t + 5$ on the interval $[0, 6]$ by verifying Rolle's theorem b) Verify Rolle's theorem for the function $f(x) = x^2 \, in \, [-1, 1]$	10	CO3	BT3
11	Determine the value of c and verify Lagrange's mean value theorem for the following functions **(a)** $f(x) = \sin x$ **in** $[0, \pi]$ **(b)** $f(x) = x^2$ **in** $[2, 4]$**.**	10	CO3	BT3

PART E: Answer Any 1 Following Questions. 10 M				
Q.N.	**Questions**	**M**	**CO**	**BT**
12	Apply L'Hospital's rule and find the value of the following (a) $\lim_{x \to 0} \frac{e^x - \cos x}{x}$ (b) $\lim_{x \to 0} (\tan x \times \log x)$	10	CO3	BT3
13	Use L'Hospital's rule to find the value of the following $\lim_{x \to 0} \left(\frac{a^x + b^x + c^x}{3} \right)^{\frac{1}{x}}$	10	CO3	BT3