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# PRESIDENCY UNIVERSITY

BENGALURU

## Make up Examinations – December 2025

Date: 30 – 12- 2025

Time: 01:00pm – 04:00pm

School: SOE/SOCSE	Program: B. Tech	
Course Code : MAT1001	Course Name: Calculus and Linear Algebra	
Semester: MK	Max Marks:100	Weightage: 50%

CO - Levels	C01	C02	C03	C04	C05
Marks	46	46	44	44	-

### 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.	Find the sum and product of the Eigen values of $A = \begin{bmatrix} 3 & -4 & 4 \\ 1 & -2 & 4 \\ 1 & -1 & 3 \end{bmatrix}$ .	2 Marks	L2	C01
2.	Write the matrix of the quadratic form $2x_1^2 - 2x_2^2 + 4x_3^2 + 2x_1x_2 - 6x_1x_3 + 6x_2x_3$ .	2 Marks	L1	C01
3.	State Cayley Hamilton Theorem.	2 Marks	L3	C01
4.	State Euler's theorem for the homogeneous function $f(x, y)$ .	2 Marks	L4	C02
5.	Define the Jacobian of $u, v$ with respect to $x, y$ .	2 Marks	L5	C02
6.	Write the condition for the function $f(x, y)$ is maximum at $(x_0, y_0)$ .	2 Marks	L2	C02
7.	Evaluate $\int_0^{\infty} x^6 e^{-x} dx$ .	2 Marks	L1	C03
8.	Evaluate $\int_0^1 \int_0^x xy dy dx$ .	2 Marks	L4	C03
9.	Find the complementary function of $(D^2 - 11D + 30)y = 0$ .	2 Marks	L3	C04
10.	If the two roots are real and distinct of the auxiliary equation, then write the complementary function.	2 Marks	L2	C04

## Part B

**Answer the Questions.**

**Total Marks 80M**

<b>11.</b>	<b>a.</b>	Find the rank of the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 2 \\ 2 & 6 & 5 \end{bmatrix}$ by reducing into row echelon form.	10 Marks	L4	C01
	<b>b.</b>	Verify Cayley Hamilton theorem, find $A^{-1}$ and $A^4$ for the matrix $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$	10 Marks	L3	C01
<b>Or</b>					
<b>12.</b>	<b>a.</b>	By an orthogonal transformation, reduce the Quadratic form $3x^2 - 2y^2 - z^2 - 4xy + 12yz + 8xz$ to a canonical form.	20 Marks	L4	C01
<b>13.</b>	<b>a.</b>	Find the extreme values of $x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$ .	12 Marks	L3	C02
	<b>b.</b>	If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$ , prove that $xu_x + yu_y + zu_z = 0$ .	8 Marks	L4	C02
<b>Or</b>					
<b>14.</b>	<b>a.</b>	If $x = r \sin\theta \cos\phi, y = r \sin\theta \sin\phi, z = r \cos\theta$ , then find $\frac{\partial(x,y,z)}{\partial(r,\theta,\phi)}$ .	10 Marks	L2	C02
	<b>b.</b>	If $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$ , then prove that $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = \frac{-\cot u}{2}$ .	10 Marks	L1	C02
<b>15.</b>	<b>a.</b>	Evaluate $\int_{-c}^c \int_{-b}^b \int_{-a}^a (x^2 + y^2 + z^2) dz dy dx$ .	10 Marks	L3	C03
	<b>b.</b>	Evaluate $\int_0^4 x^{\frac{3}{2}} (4-x)^{\frac{5}{2}} dx$ using beta function.	10 Marks	L4	C03
<b>Or</b>					
<b>16.</b>	<b>a.</b>	Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3 y dx dy$ .	10 Marks	L3	C03
	<b>b.</b>	Evaluate $\int_0^1 \int_x^{\sqrt{x}} xy dy dx$ by changing the order of integration.	10 Marks	L2	C03
<b>17.</b>	<b>a.</b>	Solve $(D^2 + 2D + 4)y = \sin 3x + 5$ .	10 Marks	L3	C04
	<b>b.</b>	Solve $(D^2 - 2D + 5)y = e^{2x} \sin x$ .	10 Marks	L2	C04
<b>Or</b>					
<b>18.</b>	<b>a.</b>	Solve $(D^2 + 2D + 3)y = e^x \sin x$ .	10 Marks	L1	C04
	<b>b.</b>	Solve $(D^2 + 9)y = \frac{1 - \cos 2x}{2}$	10 Marks	L4	C04