Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025

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

School: SOE, SOCSE	**Program**: B. TECH ALL PROGRAM	
Course Code : MAT2301	**Course Name:** Calculus and Differential Equation	
Semester: I	**Max Marks**:100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Marks	**14**	**14**	**24**	**22**	**12**	**14**

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.	State Rolle's theorem	**2 Marks**	**L1**	**CO1**
2.	Write the Euler's formula for homogeneous theorem	**2 Marks**	**L1**	**CO1**
3.	Determine Jacobian of u, v with respect to x, y, where $u = x - y;\ v = x + y$.	**2 Marks**	**L1**	**CO2**
4.	Write the formula of Taylor's Theorem for functions of two variables	**2 Marks**	**L1**	**CO2**
5.	Determine $\Gamma(\frac{3}{2})$	**2 Marks**	**L1**	**CO3**
6.	If $I_n = \int_0^{\frac{\pi}{2}} sin^n x\, dx$, evaluate I_0	**2 Marks**	**L1**	**CO3**
7.	Determine $\int_{-1}^{1}\int_{0}^{2} dxdy$	**2 Marks**	**L1**	**CO4**
8.	Find the order and degree of $\frac{d^2x}{dt^2} + n^2x = 0$	**2 Marks**	**L1**	**CO5**
9.	Find the integrating factor (I.F) of the $\frac{dy}{dx} + xy = sinx$	**2 Marks**	**L1**	**CO6**
10.	Verify the differential equation $(x^2 - ay)dx = (ax - y^2)dy$ is exact or not?	**2 Marks**	**L1**	**CO6**

Part B

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

11.	**a.**	State Lagrange's Mean Value Theorem and verify for the function $f(x) = x^2 - 4x - 3$ in $[1, 4]$.	**10 Marks**	**L3**	**CO1**
		Or			
12.	**a.**	Evaluate $\lim_{x \to 0} (1 + \sin x)^{\cot x}$.	**10 Marks**	**L3**	**CO1**
13.	**a.**	Find the maximum and minimum values of the function $f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$	**10 Marks**	**L3**	**CO2**
		Or			
14.	**a.**	Expand $x^2y + 3y - 2$ in the power of $x - 1$ and $y + 2$ using Taylor's theorem.	**10 Marks**	**L3**	**CO2**
15.	**a.**	**Prove** that $\Gamma(\frac{1}{2}) = \sqrt{\pi}$	**10 Marks**	**L3**	**CO3**
		Or			
16.	**a.**	**Evaluate** $\int_0^4 x^{\frac{3}{2}}(4 - x)^{\frac{5}{2}}\, dx$	**10 Marks**	**L3**	**CO3**
17.	**a.**	**Evaluate the integrals** $\int sin^5 x\ dx$	**5 Marks**	**L3**	**CO3**
	b.	**Evaluate the integrals** $\int_0^1 x^6\sqrt{1 - x^2}\, dx$	**5 Marks**	**L3**	**CO3**
		Or			
18.	**a.**	**Evaluate the integral** $\int \cos^6 x\, dx$.	**5 Marks**	**L3**	**CO3**
	b.	**Evaluate the integrals** $\int_0^a x^5(a^2 - x^2)^{\frac{3}{2}}\, dx$	**5 Marks**	**L3**	**CO3**
19.	**a.**	**Evaluate** $\int_0^5 \int_0^{x^2} x(x^2 + y^2) dxdy$	**10 Marks**	**L3**	**CO4**
		Or			
20.	**a.**	Show that the area between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$ is $\frac{16}{3}a^2$.	**10 Marks**	**L3**	**CO4**
21.	**a.**	Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} (x^2 + y^2 + z^2)\, dzdydx$.	**10 Marks**	**L3**	**CO4**
		Or			
22.	**a.**	By changing the order of integration of $\int_0^1 \int_{y=x}^{\sqrt{x}} xydydx$.	**10 Marks**	**L3**	**CO4**
23.	**a.**	**Solve** $(x + 1)\frac{dy}{dx} - y = e^{3x}(x + 1)^2$	**6 Marks**	**L3**	**CO5**
	b.	**Solve** $p^2 - 7p + 12 = 0$	**4 Marks**	**L3**	**CO5**
		Or			
24.	**a.**	Solve $x\frac{dy}{dx} + y = x^3y^6$	**10 Marks**	**L3**	**CO5**
25.	**a.**	Solve $(D^2 - 2D + 5)y = e^{2x}sinx$.	**10 Marks**	**L3**	**CO6**
		Or			
26.	**a.**	Solve $y'' + 5y' + 6y = 2e^{-x}$	**10 Marks**	**L3**	**CO6**