



VIT

Vellore Institute of Technology

School of Advanced Sciences

Fall Semester 2024-2025

Continuous Assessment Test – I

Programme Name & Branch: B.Tech & All

Slot: G2+TG2

Course Name & code: Calculus & BMAT101L

Class Number (s): NIL

Faculty Name (s): NIL

Exam Duration: 90 Min.

Maximum Marks: 50

General instruction(s): Answer all questions. Each question carries 10 marks.

Q.No.	Questions	Max Marks	CO	BL
1. (i)	Find the value of c that satisfy the equation $\frac{f(b)-f(a)}{b-a} = f'(c)$ in the conclusion of Mean Value Theorem for the following function. $f(x) = \begin{cases} x^3, & -2 \leq x \leq 0 \\ x^2, & 0 < x \leq 2 \end{cases}$	5+5	CO1	BL2
(ii)	Verify Rolle's theorem for $f(x) = x(x-2)e^{\frac{3x}{4}}$ in $[0, 2]$.			
2.	Identify the inflection points and local maxima and minima of the function $f(x) = \frac{x^4}{4} - 2x^2 + 4$. Identify the intervals on which the function is concave up and concave down.	10	CO1	BL2
3.	Find the volume of the solid generated by revolving the region bounded by the parabola $y = x^2$ and the line $y = 1$ about the line $y = 1$.	10	CO1	BL2
4.	If $f(x, y) = \begin{cases} \frac{xy^2}{x^2+y^4}, & (x, y) \neq (0,0) \\ 0, & (x, y) = (0,0) \end{cases}$ Verify the continuity at origin and also find $f_x(0,0)$ and $f_y(0,0)$.	10	CO2	BL1
5. (i)	If $y_1 = \frac{x_2x_3}{x_1}, y_2 = \frac{x_3x_1}{x_2}, y_3 = \frac{x_1x_2}{x_3}$, find the Jacobian of y_1, y_2, y_3 with respect to x_1, x_2, x_3 .	5+5	CO2	BL3
(ii)	Find the total derivative of $f(x, y) = x^3y^4 + x^2y^3 + 12$			