



VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act 1956)

SCHOOL OF ADVANCED SCIENCES

Fall Semester 2024-2025
Continuous Assessment Test-I

Programme Name & Branch: B. Tech.
Slot: D2+TD2
Course Name & Code: Calculus & BMAT101L
Exam Duration: 90 Mins.
Maximum Marks: 50

General instructions:

1. Answer ALL Questions
2. Each question carries 10 marks

1	<p><input checked="" type="checkbox"/> i) Check the validity of Lagrange mean value theorem on $[4, 5]$ for the function</p> $f(x) = \frac{x-1}{x-2}$ <p><input checked="" type="checkbox"/> ii) Verify Rolle's theorem for $f(x) = x + \frac{1}{x}$ on $[\frac{1}{2}, 2]$.</p>	5+5	CO1	BL2
2	<p>Consider the continuous function $y = f(x)$ with first derivative</p> $y' = (x-1)^2(2x+3).$ <p><input checked="" type="checkbox"/> i) Identify where the extrema of f occur. <input checked="" type="checkbox"/> ii) Find the intervals on which f is increasing and the intervals on which f is decreasing. <input checked="" type="checkbox"/> iii) Find where the graph of f is concave up and where it is concave down. <input checked="" type="checkbox"/> iv) Plot some specific points, such as local maximum and minimum points, points of inflection, and intercepts.</p>	10	CO1	BL2
3	<p>Find the area of the region in the first quadrant bounded by $y = 2\sqrt{x}$ and the lines $y = 2$ and $x = 0$. If the enclosed region is revolved about the x-axis, compute the volume of the solid so generated. Sketch the graph of the region.</p>	10	CO1	BL2

<p>4</p>	<p>If $u = x + 2y + z$, $v = x - 2y + 3z$, and $w = 2xy - xz + 4yz - 2z^2$, then find the value of</p> $\frac{\partial(u, v, w)}{\partial(x, y, z)}$ <p>Is there any functional relation between u, v, and w? If yes, find it.</p>	10	CO2	BL1
<p>5</p>	<p>Consider the function</p> $f(x, y) = \begin{cases} \frac{x^2y}{x^4+y^2}, & (x, y) \neq (0, 0) \\ 0, & (x, y) = (0, 0). \end{cases}$ <p>Examine the continuity of the $f(x, y)$ at the origin. Also examine the existence of both first order partial derivatives at the origin.</p>	10	CO2	BL3