25BEC0242

REG.NO.: 25BEC0242

VIT

Vellore Institute of Technology

SCHOOL OF ADVANCED SCIENCES
CONTINUOUS ASSESSMENT TEST - I
FALL SEMESTER 2025-2026

SLOT: E1+TE1

Programme Name & Branch	: B.Tech., Common to all branch
Course Code and Course Name	: BAMAT101, Multivariable Calculus and Differential Equations
Date of Examination	: 21/08/2025
Exam Duration	: 90 minutes

Maximum Marks: 50

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply)

Course Outcomes

1. Evaluate partial derivatives and solve optimization problems involving several variables with or without constraints.
2. Solve multiple integrals in cartesian, polar, cylindrical and spherical coordinates.

Q. No	Question	M	CO	BL
1.	a. Find the total derivative $\frac{du}{dt}$ at $t = 2$ for the function $u(x, y) = \sin\left(\frac{x}{y}\right)$, where $x = e^t, y = t^2$.	5	1	2
	b. Verify whether $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$ for $f(x, y) = \log(2x + 3y)$.	5		
2.	Expand $f(x, y) = \sin(xy)$ in the powers of $(x - 1)$ and $(y - \frac{\pi}{2})$ upto third degree.	10	1	2
3.	A company manufactures x units of one item and y units of another. The total cost in dollars, f, of producing these two items is approximated by the function $f(x, y) = 5x^2 + 2xy + 3y^2 + 800$. If the production quota for $x + y = 39$, find the minimum production cost.	10	1	2
4.	Evaluate $\iint_A (x^2 + y^2)dydx$ where A is area bounded by the curves $x^2 = y$, $x = 1$ and $x = 2$ about x −axis.	10	2	3
5.	Change the order of integration in $\int_0^1 \int_y^{2-y} xydxdy$ and evaluate the integral value.	10	2	3

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