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

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

SLOT: D1+TD1

Programme Name & Branch : **B.Tech.(IT)**
Course Code and Course Name : **BAMAT101 – Multivariable Calculus and Differential Equations**
Faculty Name(s) : **Common Slot QP**
Class Number(s) : **Common Slot QP**
Date of Examination : **08-10-2025**
Exam Duration : **90 minutes** **Maximum Marks: 50**

General instruction(s): Open Text Book / Open Note Book Mode Exam

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes (CO2: Solve multiple integrals in cartesian, polar, cylindrical and spherical coordinates. CO3: Understand gradient, directional derivatives, divergence, curl, Green's, Stokes and Gauss divergence theorems. CO4. Utilize different solution methods to obtain the solution for second – order ordinary differential equations)

Q. No	Question	M	CO	BL
1.	Use polar coordinates to evaluate $\iint_R e^{1-x^2-y^2}\, dA$ where R is the region in the 4th quadrant between $x^2 + y^2 = 16$ and $x^2 + y^2 = 36$.	10	2	3
2.	Use spherical coordinates to evaluate $\iiint_R x^2\, dv$ where R is the region inside both $x^2 + y^2 + z^2 = 36$ and $z = -\sqrt{3x^2 + 3y^2}$.	10	2	3
3.	Consider the vector field $F_1 = (ax^2y + z^3)\,\vec{i} + (x^3 + byz^2)\,\vec{j} + (cy^2z + 3xz^2)\,\vec{k}$, where a, b and c are constants. a) Form a new vector field F_2 from F_1 by calculating the values of a, b and c such that the vector field is irrotational. b) Find a potential function ϕ for the vector field F_2.	10	3	2
4.	Let S be a region of pixels. A vector field $F = y\,\vec{i} + xz\,\vec{j} + x^2\,\vec{k}$ is assigned to each pixel, representing the texture of the pixels. The closed curve C of pixels outlines a triangular region cut from the plane $x + y + z = 1$ by the first octant of the pixels (counterclockwise when viewed from above). Verify Stokes' Theorem for these details.	10	3	3
5.	Form an ordinary differential equation for a series RLC circuit with $R = 20\ \Omega$, $L = 10H$, and $C = 5F$. Also, find the current response in the circuit, at $t = 0$, $q(t) = 1$ and $q'(t) = 0$.	10	4	3

****