



VIT

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

Continuous Assessment Test (CAT)- II- October 2024

Programme	: B.Tech.	Semester	: Fall 2024-2025
Course Title	: Calculus	Code	: BMAT101L
		Slot	: E1+TE1
Faculty	: Dr. SAGITHYA T Dr. SANKARSAN TARAI Dr. SANDIP SAHA Dr. VIJAY KUMAR P Ms. KIRUTHIKA Dr. NATHIYA N Dr. SUDIP DEBNATH Dr. SAURABH CHANDRA MAURY Dr. SOUMENDU ROY Ms. SRILEKHA	Class Nbr	: CH2024250103894 CH2024250103896 CH2024250103901 CH2024250103905 CH2024250103919 CH2024250103920 CH2024250103922 CH2024250103924 CH2024250103926 CH2024250103996
Duration	: 1 ½ Hours	Max. Marks	: 50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Only non-programmable calculator without storage is permitted.

PART A

Answer all the Questions (5 x 10 = 50 marks)

Q.No.	Question Description	Marks
1.	(a) Expand $f(x, y) = e^{xy} + x \cos y + y^2$ in powers of x and y up to second degree. (b) Find the extrema of the function $f(x, y) = x^3 y^2 (1 - x - y)$.	4+6
2.	Find the maximum and minimum values of the function $f(x, y) = 81x^2 + y^2$ subject to the constraint $4x^2 + y^2 = 9$.	10
3.	Change the order of integration and evaluate the integral $\int_0^1 \int_y^{10y} xy \, dx \, dy$.	10
4.	(a) Evaluate $\int_D (3x^2 + y^2) dA$, where $D = \{(x, y) : -2 \leq y \leq 3, y^2 - 3 \leq x \leq y + 3\}$. (b) Use the triple integral to find the volume of the tetrahedron bounded by the four planes $x = 0, z = 0, x = 2y$ and $x + 2y + z = 2$.	5+5
5.	(a) Evaluate $\int_0^{\pi/2} \int_0^{\cos \theta} r \sqrt{a^2 - r^2} \, dr \, d\theta$. (b) Prove that $\int_0^1 x^{n-1} \left(\log_e \left(\frac{1}{x} \right) \right)^{m-1} dx = \frac{1}{n^m} \Gamma(m)$.	4+6