



VIT
Vellore Institute of Technology
CHENNAI

Reg. Number:

25BCE1996

Continuous Assessment Test (CAT) – I AUGUST 2025

Programme	: B.Tech.	Semester	: FALL SEMESTER 2025-26
Course Code & Course Title	: BAMAT101 & Multivariable Calculus and Differential Equations	Slot	: BI+TBI
Faculty	: SRUTHA KEERTHI B, KALYANI DESIKAN, SHANTHA SHEELA J, SANDIP, KRITI ARYA, KARTHIK S, SANDIP KUMAR DAS, MOHIT KUMAR, N RAMESH BABU, SHOBA PANDIAN, PICHANI CHANDRIKA, GOMATHI D, DIVYA S RAJ, SARANYA M, UMA MAHESWARI S, THANGARAJ M, ASWINI K, MINI GHOSH, SAURABH CHANDRA MAURY, ANKIT KUMAR, BHARANI DHARAN K, ANNAL R, NAZEER ANSARI, RAVINDAR RAJ C	Class Number	: CH2025260103296, 3297, 3301, 3302, 3303, 3304, 3305, <u>3307</u> , 3310, 3311, 3314, 3315, 3317, 3498, 3511, 3519, 3522, 3523, 3524, 3526, 3527, 3528, 3947, 4059
Duration	: 90 Minutes	Max. Mark	: 50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Su b Se c.	Description	Marks	CO	BT Level
1.	a.	How fast is the volume V of a rectangular box changing when its length l is 10 feet and increasing at the rate of 2 ft/s , its width w is 5 feet and decreasing at the rate of 1 ft/s , and its height h is 3 feet and increasing at the rate of 2 ft/s ? <i>Handwritten: $l=10$, $\frac{dw}{dt} = -1$, $\frac{dh}{dt} = 2$, $w=5$</i>	5	1	K3
	b.	Let $u = f(x, y)$, $x = r \cos(\theta)$, $y = r \sin(\theta)$. Find $\left(\frac{\partial u}{\partial r}\right)^2 + \frac{1}{r^2} \left(\frac{\partial u}{\partial \theta}\right)^2$ in terms of $\left(\frac{\partial u}{\partial x}\right)$ and $\left(\frac{\partial u}{\partial y}\right)$.	5	1	K3
2.	a.	A right circular cone has a slant height of 6 cm. If r is the radius of the base and h is the height of the cone, find the values of r and h that maximize the volume of the cone by	10	1	K3

		using Lagrange multiplier method. Also, find the maximum volume of the cone.				
	a.	Evaluate the Taylor series for the function $f(x, y) = e^{(2y)^*} \sin(xy)$ up to second order centered at $x = 1$ and $y = \frac{\pi}{4}$.	5	1		K3
3.	b.	Consider $u = r \cos \theta$, $v = r \sin \theta$ and $w = z + r^2$. Compute $\frac{\partial(x, y, t)}{\partial(r, \theta, z)}$, where $x = u + v$, $y = u - v$ and $t = w$.	5	1		K3
		Change the order of integration in				
4.	a.	$I = \int_0^1 \int_{x^2}^{2-x} 4xy \, dy \, dx$ and hence evaluate the same.	10	2		K3
		Find the volume under the plane $2x + 5y + 3z = 13$ over the region $0 \leq x \leq 3, -1 \leq y \leq 4$ and sketch the region of integration in the xy-plane.	5	2		K2
5.	a.					
	b.	Evaluate $I = \int_0^a \int_0^x \frac{x}{x^2 + y^2} \, dy \, dx$.	5	2		K2

***** All the best *****

K2 - Understanding; K3 - Apply

Integrate

$$Z = \frac{13 - 2a - 5y}{3}$$