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

Reg. Number: 25BMM1176

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	:	B1+TB1
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, 3307, 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	Sub Sec.	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?	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.			
3.	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
	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
4.	a.	Change the order of integration in $I = \int_0^1 \int_{x^2}^{2-x} 4xy\, dy\, dx$ and hence evaluate the same.	10	2	K3
5.	a.	Find the volume under the plane $2x + 5y + 3z = 13$ over the region $0 \le x \le 3, -1 \le y \le 4$ and sketch the region of integration in the xy −plane.	5	2	K2
	b.	Evaluate $I = \int_0^a \int_y^a \frac{x}{x^2+y^2}\, dy\, dx$.	5	2	K2

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

K2 – Understanding; K3 - Apply

$$z = \frac{13 - 2x - 5y}{3}$$