VIT

Vellore Institute of Technology

Continuous Assessment Test (CAT) – 1 – November 202

Programme	: **B.Tech.**	Semester	Fall 202
Course Title	: **Calculus**	Code	BMAT1
			101L
Faculty	:	Slot	B1+TB1
		Class No.	CH2022
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	Dr. Karan Kumar Pradhan, Dr. Manoj Kumar Singh, Dr. Pankaj Shukla, Dr. Abhishek Kumar Singh, Dr Dhansekhar, Dr Berin Alan, Dr. Kirti Aarya, Dr Kalyan Manna, Dr Vijay Kumar Poshala, Dr. Sandeep Saha		CH2022
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Duration	: **1 ½ Hours**	Max. Marks	50

Answer all the Questions (50 marks)

Q.No.	Question Description	Mark
1.	(a) Let $f(x)$ be twice differentiable on $[0,2]$. Show that if $f(0) = 0$, $f(1) = 2$ and $f(2) = 4$, then there exists $x_0 \in (0,2)$ such that $f''(x_0) = 0$. (b) Show that $f(x) = \sin x\,(1 + \cos x)$ has a local maximum at $x = \frac{\pi}{3}$, and then find the local maximum value.	[5+5
2.	Find the critical points of $f(x) = x^{\frac{1}{3}}(x^2 - 4)$. Identify the intervals on which $f(x)$ is increasing and decreasing. Further, find the function's local extreme values.	[10]
3.	Find the volume of the solid generated by revolving the region bounded by the graphs of $y = \sqrt{x}$, $y = 2 - x$ and $y = 0$ about the x-axis. Sketch the region under consideration.	[10
4.	Using $\varepsilon - \delta$ definition the limit of the function $f(x, y) = \frac{4xy^2}{x^2+y^2}$ exits or not?	[10
5.	If $u = 3x + 2y - z$, $v = x - 2y + z$ and $w = x(x + 2y - z)$, show that they are functionally related, and find the relation between them.	[10

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