Reg. No.: 22BCL1019

Name : G.B. SATHWIKA

VIT

Vellore Institute of Technology

Continuous Assessment Test (CAT)- I– November 2022

Programme	:	B.Tech.	Semester	:	Fall 2022-2023
Course Title	:	Calculus	Code	:	BMAT101L/IMAT 101L
			Slot	:	B1+TB1
Faculty	:	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	Class No.	:	CH2022231700262, CH2022231700260, CH2022231700270, CH2022231700272, CH2022231700268, CH2022231700481, CH2022231700612, CH2022231700751, CH2022231700482, CH2022231700484
Duration	:	1 ½ Hours	Max. Marks	:	50

Answer all the Questions (50 marks)

Q.No.	Question Description	Marks
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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