Reg. No.:

Name :

VIT

Vellore Institute of Technology

Continuous Assessment Test (CAT)- 1– October 2022

Programme	:	B.Tech.	Semester	:	Fall 2022-2023
Course Title	:	Calculus	Code	:	BMAT101L
Faculty	:	Dr. Balamurugan, Dr. Saroj Kumar Dash, Dr. Mini Ghosh, Dr. Manimaran, Dr. Sowndarrajan, Dr. Prabhakar, Dr. Rajesh Kumar, Dr. Soumendu Roy	Slot	:	A2+TA2
			Class ID	:	CH2022231700410, 416,429,440,443,573,604,610
Duration	:	1 ½ Hours	Max. Marks	:	50

Answer all the Questions (50 marks)

Q.No.	Question Description	Marks
1.	**(a).** Verify Rolle's theorem for the function $f(x) = x^3 - 7x^2 + 16x - 12$ in [2,3].	[5]
	(b). Let $f(x) = \frac{x^3}{4} - 3x, x \in \mathbb{R}$. Find the intervals on which $f(x)$ is increasing (or) decreasing.	[5]
2.	Find the maximum and minimum values of $f(x) = \lvert 4 - x^2 \rvert, x \in [-4,4]$. Also find the absolute maximum and absolute minimum, if they exist.	[10]
3.	Find the area of the region in the second quadrant that is bounded above by the curve $x^2 + y^2 = -2x$ and below by x-axis and the line $y = x + 1$.	[10]
4.	Find f_x, f_y, f_{xy} and f_{yx} at each point of the domain of $f(x,y)$, where $f(x,y) = \sqrt{x^2 + y^2}$.	[10]
5.	**(a).** The time period 'T' of a pendulum of length 'L' is: $T = \frac{2\pi\sqrt{L}}{\sqrt{g}}$, where 'g' is the acceleration due to gravity. A pendulum is moved from the "Canal Zone", where g=32.09 feet per second square, to "Greenland", where g=32.23 feet per second square. Because of the change in temperature, the length of the pendulum changes from 2.5 feet to 2.48 feet. Find the error in the time period of the pendulum.	[5]
	(b). If $u(x,y) = xy - (\sqrt{1-x^2})(\sqrt{1-y^2})$ and $v(x,y) = \cos^{-1}(x) + \cos^{-1}(y)$, then find the relation between 'u' and 'v', if there is any relation between them.	[5]

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