VIT

Vellore Institute of Technology

Name of Examination:	Continuous Assessment Test(CAT-I), Fall Semester 2022-23 (Nov., 2022)				
Programme Name:	B. Tech.	**Duration:**	90 Minutes	**Max. Marks:**	50 Marks
Slot:	A2+TA2				
Course Code:	BMAT101L	**Course Title:**	Calculus		

Answer all the questions
(Each question carries 10 marks)

1. (a). For the following function $f(x) = \ln(4 + 2x - x^2)$, verify that the hypotheses of Rolle's Theorem are satisfied on the interval $[-1,3]$, and find all values of c in that interval that satisfy the conclusion of the theorem. [5 M]

   (b). Use Mean-Value Theorem to show $|\tan x - \tan y| \geq |x - y|$ for all values of x and y in the interval $(-\pi/2, \pi/2)$. [5 M]

2. Find the intervals in which the function given by $f(x) = \sin(x) + \cos(x), 0 \leq x \leq 2\pi$ is strictly increasing or strictly decreasing. [10 M]

3. Find the area of the region bounded by the parabola $x^2 = 8y$ and the line segment $-x + 2y = 8$. [10 M]

4. (a). Investigate the continuity of the function $f(x,y) = \frac{\sqrt[3]{x}y^2}{x+y^3}$ at orgin. [5 M]

   (b). Use an appropriate form of the chain rule to find $\frac{\partial z}{\partial u}$ and $\frac{\partial z}{\partial v}$ for $z = 3x - 2y; x = u + v\ln(u)$, $y = u^2 - v\ln(v)$. [5 M]

5. If $u = x\sqrt{1-y^2} + y\sqrt{1-x^2}$ and $v = sin^{-1}x + sin^{-1}y$, show that u,v are functionally related and find the relationship. [10 M]

*** All the Very Best***