

Programme Name & Branch : B.Tech

Slot: E2+TE2-common

Course Name & code: Calculus & BMAT101L

Class Number: Common to all E2+TE2 slot

Exam Duration: 90 Min.

Maximum Marks: 50

Answer all the questions-(Each question carries 10 marks)

Q.No.	Question	Marks
1.	<p>a) Examine the validity and conclusion of Rolle's theorem for the function <math>f(x) = e^x \sin x, \forall x \in [0, \pi]</math>.</p> <p>b) Examine the validity and conclusion of Lagrange's Mean Value theorem for the function <math>f(x) = x(x-1)(x-2)</math> for every <math>x \in \left[0, \frac{1}{2}\right]</math>.</p>	5+5
2.	<p>Using the first and second derivative tests, discuss the monotonicity, relative extrema, concavity and the points of inflection of <math>f(x) = \frac{x^3}{3} - \frac{x^2}{2} - 2x + \frac{1}{3}</math>.</p>	10
3.	<p>a) Consider the region bounded by the graphs of <math>2x+3y=6, y=0</math> and <math>x=0</math>. Find the volume of the solid formed by revolving this region about the <math>y</math>-axis.</p> <p>b) Draw a rough sketch and find the area bounded by the curve <math>x^2 = y</math> and <math>x+y=2</math>.</p>	5+5
4.	<p>Discuss the continuity of <math>f(x, y) = \begin{cases} \frac{3xy^2}{x^4 + y^4}; &amp; (x, y) \neq (0, 0) \\ 0 &amp; ; (x, y) = (0, 0) \end{cases}</math> at origin and also find <math>f_x(0, 0)</math> and <math>f_y(0, 0)</math>.</p>	10
5.	<p>a) If <math>u = f(x-y, y-z, z-x)</math>, find <math>\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}</math>.</p> <p>b) Find <math>\frac{du}{dt}</math> if <math>u = x^2 + y^2 + z^2</math> where <math>x = e^t, y = e^t \sin t, z = e^t \cos t</math></p>	6+