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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF INFORMATION SCIENCE
MID TERM EXAMINATION - APR 2023**

Semester : Semester II -2022

Course Code : MAT1010

Course Name : Sem II - MAT1010 - Fundamenta Calculus

Program : BSD

Date : 15-APR-2023

Time : 9:30AM - 11:00AM

Max Marks : 50

Weightage : 25%

Instructions:

- (i) Read all questions carefully and answer accordingly.
- (ii) Question paper consists of 3 parts.
- (iii) Scientific and non-programmable calculator are permitted.
- (iv) Do not write any information on the question paper other than Roll Number.

PART A

ANSWER ALL THE QUESTIONS

(5 X 2 = 10M)

1. State Lagrange's Mean Value theorem (CO1) [Knowledge]
2. State Cauchy's Mean Value Theorem (CO1) [Knowledge]
3. Check the continuity of a function $f(x) = \begin{cases} 2x+3 & \text{if } x > 0 \\ 5-x & \text{if } x < 0 \end{cases}$ at $x=0$ (CO1) [Knowledge]
4. State Maclaurn's theorem for $f(x)$ (CO1) [Knowledge]
5. Define differentiability of a function (CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(4 X 5 = 20M)

6. Verify $f(x) = e^x$ in $[0, 1]$ by using Lagrange's mean value theorem (CO1) [Comprehension]
7. Suppose that $z = x^2y, x = t^2 + t$ and $y = t^3 + t + 4$, use chain rule to find $\frac{dz}{dt}$ (CO2) [Comprehension]

8. Check whether the limits $\lim_{(x,y) \rightarrow (0,0)} \frac{x^2 - y^2}{x^2 + y^2}$ and $\lim_{(x,y) \rightarrow (0,0)} \frac{xy}{x^2 + y^2}$ exist or not

(CO2) [Comprehension]

9. Find the extreme value of the function $x^3 + y^3 - 3x - 12y + 20$

(CO2) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 10 = 20M)

10. Show that $\lim_{x \rightarrow 0} \frac{e^x - \cos x}{x} = 1$ and $\lim_{x \rightarrow 0} \frac{e^x + e^{-x} - 2\cos x}{x \sin x} = 2$

(CO2) [Application]

11. Examine the function $x^3 + y^3 - 3axy$ for maxima and minima

(CO2) [Application]