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**PRESIDENCY UNIVERSITY
BENGALURU**

**SCHOOL OF INFORMATION SCIENCE
END TERM EXAMINATION - JUN 2023**

Semester : Semester II - 2022

Course Code : MAT1010

Course Name : Sem II - MAT1010 - Fundamenta Calculus

Program : BSD

Date : 14-JUN-2023

Time : 1.00PM - 4.00PM

Max Marks : 100

Weightage : 50%

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

(10 X 2 = 20M)

1. Define homogeneous function.

(CO5) [Knowledge]

2. State Taylor's theorem for two variable function.

(CO5) [Knowledge]

3. Define Taylor's series for a function

(CO1) [Knowledge]

4. State Lagrange's Mean Value theorem

(CO1) [Knowledge]

5. Write the conditions for the function is maxima.

(CO1) [Knowledge]

6. If $rt - s^2 > 0$ and $r < 0$, then the function $f(x_0, y_0)$ is?

(CO1) [Knowledge]

7. Write Cauchy's mean value theorem.

(CO1) [Knowledge]

8. Simplify, $I = \int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \cos^8 x dx$.

(CO4) [Knowledge]

9. Write the relation between Beta and Gamma function.

(CO4) [Knowledge]

10. Find $\lim_{x \rightarrow 0} \frac{\sqrt{1+x}}{2} + 1$.

(CO1) [Knowledge]

PART B

ANSWER ALL THE QUESTIONS

(5 X 10 = 50M)

11. If $u = f(2x - 3y, 3y - 4z, 4z - 2x)$, prove that $\frac{1}{2}u_x + \frac{1}{3}u_y + \frac{1}{4}u_z = 0$

(CO1) [Comprehension]

12. Find the value $\lim_{x \rightarrow 0} \left(\frac{\sin x}{x} \right)^{1/x}$.

(CO1) [Comprehension]

13. If $z = \tan^{-1} \left(\frac{x^3 + y^3}{x + y} \right)$, then prove that $x \frac{\partial z}{\partial x} + y \frac{\partial z}{\partial y} = \sin 2z$.

(CO5) [Comprehension]

14. Verify the given function $f(x) = e^x$ in $[0, 1]$, using Lagrange's mean value theorem.

(CO1) [Comprehension]

15. Evaluate $\int_0^{\infty} \frac{x^4}{(1+x^2)^4} dx$.

(CO4) [Comprehension]

PART C

ANSWER ALL THE QUESTIONS

(2 X 15 = 30M)

16. Find maximum and minimum values of the function $f(x, y) = x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x$.

(CO1) [Application]

17. Obtain the reduction formula for $\int \sin^n x dx$ and $\int_0^{\pi/2} \sin^n x dx$.

(CO4) [Application]