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Indian Institute of Information Technology, Design and Manufacturing, Kancheepuram

Quiz 2 – October 2023

Course Code: MA1000 | **Course Title: Calculus**

Batches: All Batches | Category: Core

Date of Examination: 30.10.2023 | Instructors: Dr Sai / Dr Subramani / Dr Vijayakumar

Duration: 1 Hour | Maximum Marks: 25

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1. Let a and b be positive numbers. Prove that the series $\sum_{n=1}^{\infty} \frac{1}{an+b}$ diverges. (4)

2. State and prove the ratio test. (4)

3. Determine the values of p for which the alternating p-series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^p}$ converges (a) absolutely; (b) conditionally. (4)

4. Find the Taylor series of the function $f(x) = \frac{1}{x}$ about the point $x = 2$. Also determine the interval on which this Taylor series converges to $f(x) = \frac{1}{x}$. (5)

5. Suppose that the inequalities

$$\frac{1}{2} - \frac{x^2}{24} < \frac{1-\cos x}{x^2} < \frac{1}{2}$$

hold for values of x close to zero. Compute

$$\lim_{x \to 0} \frac{1-\cos x}{x^2}.$$

Justify your answer. (4)

6. For what values of b is

$$g(x) = \begin{cases} x, & x < -2 \\ bx^2, & x \geq -2 \end{cases}$$

continuous at every x. (4)