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Mahindra University Hyderabad
École Centrale School of Engineering
Minor II
(2023-Batch)
Program: B. Tech   Branch: Computation & Mathematics
Year: II   Semester: Fall
Subject: Real Analysis (MA 2104)

Date: 24/10/2024   Start Time: 10.00 AM
Time Duration: 1 hr 30 mins   Max. Marks: 20

Instructions

1. All questions are compulsory.

2. In all questions, justifications are required.

Q.1

Prove that the sequence of functions $\{f_n\}$ where $f_n(x) = \dfrac{x^n}{1 + x^n}$, $x \in [0, 2]$ is not uniformly convergent on $[0, 2]$.   **5M**

Q.2

Determine whether the series of functions $\displaystyle\sum_{n=1}^{\infty} \dfrac{\sin x}{n^4 + n^2 x^2}$ converges uniformly for all real x.   **5M**

Q.3

Prove that in discrete metric space every subset is both open and closed.   **5M**

Q.4

Let

$$f(x) = \begin{cases} 1, & x \text{ is rational} \\ 0, & x \text{ is irrational.} \end{cases}$$

Prove that f is not Riemann-integrable on $[0, 1]$.   **5M**