Mahindra University, Hyderabad
École Centrale School of Engineering
MINOR II Examinations, November 2023 (2021 Batch)
Program: B. Tech. (Common to CM and NT)
Year: III Semester: I
Subject: Computational Methods for PDE (MA 3115)

Date: 09/11/2023 Time: 2:00 PM-03:30 PM
Time Duration: 1.5 hours Max. Marks: 25

Instructions:

1. Answer all the questions.
2. Marks will not be awarded for guess work.
3. All the answers that belong to a particular question should be answered in one place in your answer booklet.

Q 1: Marks: 05

Find Fourier series representation of $f(x) = |x|, \ -\pi < x < \pi$. Then find the value of $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$

Q 2: Marks: 10

Solve the following 1D Heat equation using method of separation of variables

$$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}, \ 0 < x < 1, \ t > 0,$$

such that $u(0,t) = 0, \ u(1,t) = 0, \ u(x,0) = \begin{cases} 2x, & 0 \leq x \leq 0.5 \\ 2(1-x), & 0.5 \leq x \leq 1. \end{cases}$

Q 3: Marks: 10

Solve the following Laplace equation using method of separation of variables

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, \ 0 < x < 1, 0 < y < 1,$$

such that $u(x,0) = x(x-1), \ u(x,1) = 0, \ 0 \leq x \leq 1, \ u(0,y) = 0$ and $u(1,y) = 0, \ 0 \leq y \leq 1.$