

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

Date: 16/09/2022
Time Duration: 1.5 hours

Time: 2:00 PM-03:30 PM
Max. Marks: 20

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.
4. Scientific calculators are permitted.

Q 1:

Marks: 05

Solve the first order linear PDE

$$y \frac{\partial u}{\partial x} + x \frac{\partial u}{\partial y} = 0, \quad u(0, y) = e^{-y^2}.$$

Q 2:

Marks: 10

Classify the following PDE then transform it to the canonical form

$$x^2 \frac{\partial^2 u}{\partial x^2} - y^2 \frac{\partial^2 u}{\partial y^2} = 0, \quad x > 0 \text{ and } y > 0.$$

Q 3:

Marks: 05

Solve the 1D wave equation

$$\frac{\partial^2 u}{\partial t^2} - c^2 \frac{\partial^2 u}{\partial x^2} = 0, \quad x \in \mathbb{R}, \quad t > 0,$$

such that

$$u(x, 0) = \sin(x) \text{ and } u_t(x, 0) = \cos(x).$$