Mahindra University École Centrale School of Engineering
Hyderabad
Minor II Examination

Program: B. Tech.   Branch: CSE, ECM, ECE, AI, CE, ME, CM, MEC, NT, COM

Year: I   Semester: Spring
Subject: Mathematics II (MA 1202)
(2023 Batch)

Date: 16/04/2024   Start Time: 10.00 AM
Time Duration: 90 Minutes   Max. Marks: 20

Instructions:

1. All questions are compulsory.

2. The order of answers should be same as the order of questions.

3. Justification of your answers is absolutely necessary. Guesswork will not be considered in evaluation.

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1. Let

$$f(z) = \begin{cases} \dfrac{|z|^2}{z} & \text{if } z \neq 0 \\ 0 & \text{if } z = 0 \end{cases}$$

Using the definition of derivative, check the differentiability of f at $z = 0$.

5M

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2. Using Cauchy-Riemann equations, check if the function $f(z) = (x^2 - y^2) - i2xy$ is analytic anywhere in the complex plane.   **5M**

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3. Show that the function u defined by

$$u(x, y) = e^{-2x} \sin 2y,$$

is harmonic and determine its harmonic conjugate.   **5M**

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4. Evaluate $\displaystyle\int_C \frac{\sin z}{(z^2 - 25)(z^2 + 9)}\, dz$, where C is the circle $|z| = 1$.   **5M**

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