Mahindra University École Centrale School of Engineering
Hyderabad
Minor I 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: 28/02/2024   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.

---

1. Let $V = \mathbb{R}^3$ and let $S = \{(x, y, z) : x^2 + z^2 = 0, y \in \mathbb{R}\}$. Is S a subspace of V with respect to usual operations? If yes, find the dimension of S.   5M

---

2. Let V be the vector space of polynomials of degree less than or equal to 2. Define $<>$ on V as follows:

$$< f, g >= f(1)g(1) + f(2)g(2) \quad \forall \ f, g \in V.$$

Is $(V, <>)$ an inner product space? In case it is not, indicate which axioms are satisfied and which ones are not satisfied.   5M

---

3. Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ be a linear transformation defined as $T(x_1, x_2) = (0, 2x_2)$. Determine the null space of T. Find nullity of T and rank of T. Hence verify the rank-nullity theorem.   5M

---

4. Let $T : \mathbb{R}^2 \to \mathbb{R}^2$ defined by $T(x, y) = (x, -y)$. Find the matrix representation of T with respect to the ordered basis $\{(1, 1), (1, 0)\}$ for the domain and $\{(2, 3), (4, 5)\}$ for the co-domain respectively.   5M

****