Mahindra University École Centrale School of Engineering
Hyderabad
Minor I Examination

Program: B. Tech. Branch: CSE, ECM, ECE, AI, CE, ME, CM, MT, NT
Year: I Semester: Spring
Subject: Mathematics II (MA 1202)
(2022 Batch)

Date: 06/03/2023 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. Justify your answer wherever required. Guesswork will not be considered in evaluation.

1. Determine whether the following set $S = \left\{(x,y) \in \mathbb{R}^2 : x+y=0, x-y=1\right\}$ is a subspace of $\mathbb{R}^2$. **5M**

2. (i) Using Gram-Schmidt process construct an orthogonal basis for the subspace spanned by the following vectors: **4M**

$$x_1 = (1,1,1,1), x_2 = (0,1,1,1), x_3 = (0,0,1,1).$$

(ii) Without using Gram-Schmidt process find an orthogonal basis for the subspace spanned by the following vectors: **1M**

$$x_1 = (0,0,1,1), x_2 = (1,1,0,0), x_3 = (1,1,1,1).$$

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

4. Let $A = \begin{bmatrix} 1 & 1 & 2 & 3 \\ 3 & 4 & -1 & 2 \\ -1 & -2 & 5 & 4 \end{bmatrix}$ denote matrix of a linear transformation T. Determine $rank(T)$, $nullity(T)$, and a basis for nullspace of T. **5M**

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