Name:..... Roll No. :.....

National Institute of Technology Calicut

Department of Mathematics

First Semester M. Tech., Interim Examination I (Online), Winter Semester 2020-2021

MA6003D Mathematical Methods for Power Engineering

Duration: 1 Hour **Max. Marks: 20**

1. Find the values of m for which the vectors $u_1 = (m, 4, 0)$, $u_2 = (1, -1, 8)$ and $u_3 = (0, -1, m)$ are linearly dependent. 4

2. Let V be a vector space of functions $f : R \to R$. Check whether the following subsets of V are subspaces of V.

   (a) $W_1 = \{f(x) : f(1) = 0\}$

   (b) $W_2 = \{f(x) : f(3) = f(1)\}$. 4

3. Let $T : R^4 \to R^3$ be the linear transformation defined by $T(x_1, x_2, x_3, x_4) = (x_1 + 2x_2 + 3x_3 - x_4, 3x_1 + 5x_2 + 8x_3 - 2x_4, x_1 + x_2 + 2x_3)$

   (a) Find the matrix A such that $TX = AX, A \in R^4$.

   (b) Find a basis for the kernel of T.

   (c) Find the rank of the linear transformation T. 6

4. Suppose the following information is known for a 3×3 matrix A

$$A\begin{bmatrix}1\\2\\1\end{bmatrix} = 6\begin{bmatrix}1\\2\\1\end{bmatrix}, A\begin{bmatrix}1\\-1\\1\end{bmatrix} = 3\begin{bmatrix}1\\-1\\1\end{bmatrix}, A\begin{bmatrix}2\\-1\\0\end{bmatrix} = 3\begin{bmatrix}1\\-1\\1\end{bmatrix}$$

   (a) Find the Eigen values of A.

   (b) Find the dimensions of the corresponding Eigen spaces.

   (c) Is A diagonalizable?

   (d) Is A invertible? 6