COURSE: LINEAR ALGEBRA
Course Code: MA2.101

Spring-2024

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Assignment 2: [Released date: 9.04.2024] [Submission Date: 19.04.2024]

Full Marks- 25

1. Find all the real values of k for which the following matrices are diagonalizable:

a) $\begin{pmatrix} 1 & k & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ **b)** $\begin{pmatrix} 1 & 1 & k \\ 1 & 1 & k \\ 1 & 1 & k \end{pmatrix}$ **[CO-2][4+4=8]**

2. **(a)** Let **A** be an invertible matrix. Prove that if A is diagonalizable so is $\mathbf{A}^{-1}$.
(b) Compute the indicated power of the following matrix:

$$\begin{pmatrix} 1 & 1 & 1 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{pmatrix}^{2015}$$ **[CO-2][2+5=7]**

3. (a) Consider the vectors a = (1−i, 1+2i), b = (2+i, z) in C^2 . Determine the complex number z such that{a, b} is an orthogonal set of vectors, and hence obtain an orthonormal set of vectors in C^2.
(b) The Gram-Schmidt process applied to the vectors$\{a_1 , a_2 , a_3 \}$ yields the same basis as the Gram-Schmidt process applied to the vectors $\{a_3 , a_2 , a_1 \}$ **.** **[CO-2][3+2=5]**

4. Let M be a square matrix. Either proof or give counterexample.
a) If M is diagonalizable, then so is M^2 .
b) If M^2 is diagonalizable, then so is M. **[CO-2][2.5+2.5=5]**

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