

EE5609 Assignment 13

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Abstract—This document solves problem based on solution of vector space.

Download all solutions from

https://github.com/abhishekt711/EE5609/tree/master/Assignment_13

1 PROBLEM

Let F be a sub field of the complex numbers , and let A be the following 2×2 matrix over F .

$$A = \begin{pmatrix} 2 & 1 \\ -1 & 3 \end{pmatrix}$$

compute $f(A)$ for the polynomial $f(x) = x^2 - 5x + 7$

2 SOLUTION

Characteristic equation of A can be written as:

$$|A - \lambda I| = 0 \quad (2.0.1)$$

$$\begin{vmatrix} 2 - \lambda & 1 \\ -1 & 3 - \lambda \end{vmatrix} = 0 \quad (2.0.2)$$

The characteristics equation of the matrix will be,

$$\lambda^2 - 5\lambda + 7 = 0 \quad (2.0.3)$$

The characteristics equation will satisfy its own matrix

$$A^2 - 5A + 7I = 0 \quad (2.0.4)$$

The given polynomial

$$f(x) = x^2 - 5x + 7 \quad (2.0.5)$$

$$f(A) = A^2 - 5A + 7I \quad (2.0.6)$$

substituting (2.0.4) in (2.0.6) we get

$$f(A) = 0 \quad (2.0.7)$$