EIGEN VALUES AND CAYLEY-HAMILTON THEOREM

Important Question (PYQ)

If α is an eigen value of a non-singular matrix A, then Prove that $\frac{|A|}{\alpha}$ is an eigen value of adj A.

Proof A is a non-singular matrix

α is eigen value of A.

$\therefore$ $\exists$ a non zero $n \times 1$ Column matrix X. s.t.

$$AX = \alpha X$$

$$adj A(AX) = adj A(\alpha X)$$

$$(adj A \cdot A)X = \alpha (adj A \cdot X)$$

$$(|A| I)X = \alpha (adj A \cdot X) \quad [A \cdot adj A = |A| I]$$

$$|A|\, X = \alpha\, (\text{adj}A \cdot X)$$

$$\frac{|A|}{\alpha} X = \text{adj}A \cdot X$$

$\Rightarrow$ $\frac{|A|}{\alpha}$ is eigen value of adjA.

Hence Proved.