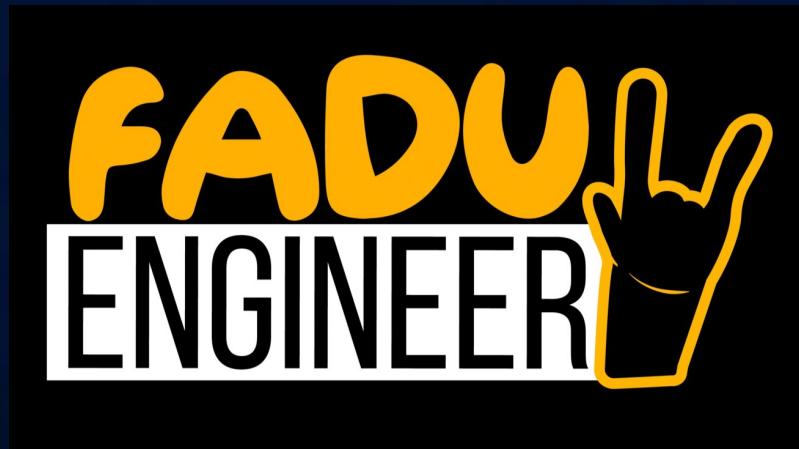


# EIGEN VALUES & EIGEN VECTORS

Important Question Bank

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## Important Questions

① Find the Eigen values and Eigen vectors of the matrix,  $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$ .

② Find the Eigen values and Eigen vectors of the matrix,  $\begin{bmatrix} 2 & 1 & 1 \\ 2 & 3 & 2 \\ 3 & 3 & 4 \end{bmatrix}$ .

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③ Find Eigen values & vectors of,

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

④ Prove that the Eigen values of  $\begin{bmatrix} \frac{1+i}{2} & -\frac{(1-i)}{2} \\ \frac{1+i}{2} & \frac{(1-i)}{2} \end{bmatrix}$  are of unit modulus.

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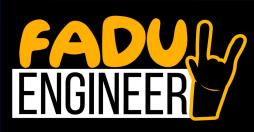
⑤ Find Eigen values and vectors of

$$A = \begin{bmatrix} -2 & 1 & 1 \\ -11 & 4 & 5 \\ -1 & 1 & 0 \end{bmatrix}$$

⑥ If  $A = \begin{bmatrix} -1 & 2 & 3 \\ 0 & 3 & 5 \\ 0 & 0 & -2 \end{bmatrix}$ , find the Eigen value of  $A^3 + 5A + 8I$ .

⑦ Find the characteristic Equation of matrix A, where

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$$



Show that the matrix A Satisfies the characteristic equation & hence find  $A^{-1}$ ,  $A^{-2}$ ,  $A^4$ .

⑧ Verify that  $A = \begin{bmatrix} 1 & 2 & 0 \\ 2 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix}$  satisfies

the characteristic Equation. Hence find  $A^{-2}$ .

⑨ If  $A = \begin{bmatrix} 1 & 4 \\ 1 & 1 \end{bmatrix}$ , find  $A^7 + 3A^2 + I$ .

⑩ Find the characteristic equation and verify that it satisfies Cayley Hamilton Theorem, where  $A = \begin{bmatrix} 1 & 0 & 2 \\ 1 & 1 & 2 \\ 2 & 1 & -1 \end{bmatrix}$ .



⑪ If  $A = \begin{bmatrix} 1 & 8 \\ 2 & 1 \end{bmatrix}$ , find   
 i)  $2A^3 - A^2 - 35A - 44I$   
 ii) Characteristic Roots of  $A^2 + 2A + I$ .

⑫ Show that the matrix  $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$  is diagnolisable. Find the transforming matrix and diagonal matrix.

⑬ Show that the matrix  $A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$  is diagnolisable. Find diagonal and transforming matrix.

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⑭ Show that the following matrix is diagnolisable. Also find diagonal & transforming matrix.

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



⑮ Find  $e^A$  and  $4^A$ , if  $A = \begin{bmatrix} 3/2 & 1/2 \\ 1/2 & 3/2 \end{bmatrix}$ .

⑯ If  $A = \begin{bmatrix} \alpha & \alpha \\ \alpha & \alpha \end{bmatrix}$ , Prove that

$$e^A = e^\alpha \begin{bmatrix} \cosh \alpha & \sinh \alpha \\ \sinh \alpha & \cosh \alpha \end{bmatrix}$$

⑰ If  $A = \begin{bmatrix} \pi & \pi/4 \\ 0 & \pi/2 \end{bmatrix}$ , find  $\cos A$ .

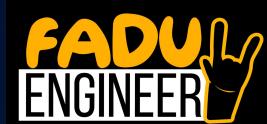
⑱ If  $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ , Prove that,

$$A^{100} = \begin{bmatrix} 201 & -400 \\ 100 & -199 \end{bmatrix}$$

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19) Show that  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$  is non-derogatory.

20) Show that  $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$



is derogatory and find its minimal polynomial.

21) Show that given matrix is derogatory , where

$$A = \begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$$

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