Paralyanana Charleints Treated

A. P. STATI INSPIRATE OF TEXTINOLOGY

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(Religious Jain Minority)

Subject: Applied Mathematics-IV

SEM:I\

5) Find the eigen values and eigen vectors of the following matrix
$$A = \begin{pmatrix} A & b & b \\ 1 & 3 & 2 \\ -1 & -5 & -2 \end{pmatrix}$$

Goln:-

The characteristic egn is

$$\lambda = (4+3-2)\lambda^{2} + ((12-6-8) - (6-6-10))\lambda - (4-6+10) - 6(-2+2) + 6(-5+3) = 0$$

$$\lambda^{3} - 5\lambda^{2} + 8\lambda - 4 = 0$$

·. A = 1/2,2.

$$\frac{\lambda=1}{(A-\lambda 5)X=0}$$

$$(A-\lambda 5)X=0$$

$$(A-\lambda 5)X$$

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Solving by Cramer's sule,

$$\frac{\chi_1}{-6+10} = \frac{-\chi_2}{-3+2} = \frac{\chi_3}{-5+2}$$
 (By considering second and third now)

$$\frac{x_1}{4} = \frac{-x_2}{+1} = \frac{x_3}{-3} = t$$

A-2 (A-AI) X=0

$$\begin{pmatrix} 2 & 6 & 6 \\ 1 & 1 & 2 \\ -1 & -5 & -4 \end{pmatrix} \begin{pmatrix} 71 \\ 72 \\ 73 \end{pmatrix} = 0.$$

By using cramer's rule,

$$\frac{\pi}{12-6} = \frac{-\pi}{4-6} = \frac{\pi}{2-6} = \pm$$

$$\frac{\chi_1}{h} = \frac{-\chi_2}{-2} = \frac{\eta_3}{-4} = t$$

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$$\frac{x_1}{3} = \frac{x_2}{1} = \frac{x_3}{2} = E$$

$$X = \begin{pmatrix} 3t \\ t \\ -2t \end{pmatrix} = t \begin{pmatrix} 3 \\ 1 \\ -2 \end{pmatrix}$$

$$X = \begin{pmatrix} 3t \\ t \\ -2t \end{pmatrix} = t \begin{pmatrix} 3 \\ 1 \\ -2 \end{pmatrix}$$

$$\therefore \begin{pmatrix} 3 \\ 1 \\ -2 \end{pmatrix}$$
is the eigenvector corresponding to

Exercise

Exercise

i) Find the eigen values
$$2$$
 eigen vectors 2

a) 3 10 5

b) 0 0 1

 3 5 7

$$\begin{pmatrix} -2 & -3 & -4 \\ 3 & 5 & 7 \end{pmatrix} \qquad \begin{pmatrix} 0 & 0 & 1 \\ 1 & -3 & 3 \end{pmatrix}$$

c)
$$\begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$$

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Subject: Applied Mathematics-IV

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O Two of the eigen values of a 3x3 matrix are -1,2. If the determinant of the matrix & 4, find its third eigen value.

NKT Roduct of eigen values - 1A1

-1x2x >3=4.

$$\lambda_3 = \frac{A}{-2}$$

$$\lambda_3 = -2$$

... The Hird eigen value is -2.

Eigen values of a Hermitian matrix are real.

Proof:- Let A be a Hermitian matrix, A the

eigen value & X the eigen vector.

Fremultiply by
$$x^0$$
 we get $X^0Ax = X^0Ax = X^0Ax = \lambda x^0x \longrightarrow 0$.

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Subject: Applied Mathematics-IV

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By taking complex conjugate transpose $_{\text{Sides}}$, $(X^0AX)^0 = (\lambda X^0X)^0$ for $(X^0AX)^0 = (\lambda X^0X)^0$

X0x0(x0) = x x0(x0) 0

Since A is Hermitian AD-A & also (x0)0= x.

·· XOAX= TXOX. -> 3.

.. 70m 0 8 0

 $\lambda x^{0} x = \overline{\lambda} x^{0} x$

0= x0x(x-K)

Sino x is a non-zero vector xox fo.

: X-X = 0

: X= X.

Hone is real.

Remark * Eigen values of a real on symmetric matrix

are all real * Eigen values of a skew-Hermitian matrix are

either purely imaginary or zeno

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Other deliments Charles of the Control of the Contr



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matrix are purely imaginary or zero.

* The eigen values of a unitary matrix are of

unit modulus.

* Eigen values of an orthogonal matrix are of unit

* If it an eigen value of A then I is on eigen value of A then I is

If $\lambda_1, \lambda_2, \ldots \lambda_n$ are the eigen values of A then $k\lambda_1, k\lambda_2, \ldots k\lambda_n$ are the eigen values of kA.

* It And are the eigen values of A then in the eigen values of A!

* Ib dida ... In one the eigen values of A

then his x2" ... In are the eigen values of 1.

A Ib A is an eigen value of a non-singular

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matrix A, then IAI is an eigen value of adj. A.

Examples:

values of 4 A + 3 A + 2 I.

soln:-

$$\lambda^2 = 5\lambda + 4 = 0$$

$$\lambda = 1/4$$

.. The eigen values of A are 1,4.

The eigen values of A ore 1, 4

The eigen ratues of I are 1,1

For Asl

Eigen value of AA+3A+2I= 4(1)+3(1)+2

For 2:4

Eigenvalur of 4A+3A+2T-4(4)+3(4)+2

= 15

-. The eigen values are 9,15.

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