

Solved by:

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Class

BSCS 6th Semester

Subject

MTH501

Solution
Type:

Final Term current Paper

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MY today Paper 😊

LU decomposition

Eigen Value Eigen Vector

Show whether vectors are orthogonal or not?

Find image of vector

Baki b orthogonal wale topics me se thy last 32 se le kr 44 tak chapters kr lo paper 80% o jay ga...!

1

Block matrix given find out whether it is invertible or not

Answer:

If the inverse of a square matrix exists, it is called an invertible matrix. An invertible matrix is called a non-singular matrix. This can also be found if $\det A \neq 0$

2

A set of vectors given find out whether set is orthogonal or not

Answer:

If $u_1 \cdot u_2 = 0$, $u_2 \cdot u_3 = 0$, $u_3 \cdot u_1 = 0$

3. A matrix was given find out whether the columns are orthonormal or not

Answer:

$U^t \cdot U = I$

4. Find out whether the vectors are linearly independent or not?

Answer:

$Y = c_1 u_1 + c_2 u_2$

$C_1 = \frac{y \cdot u_1}{u_1 \cdot u_1}$

$C_2 = \frac{y \cdot u_2}{u_2 \cdot u_2}$

$$C_1 = C_2 = 0$$

5. Find the vector v where the matrix with some scalars was given $w = \text{span}\{v\}$

Answer:

6. Find out matrix is invertible or not

Answer:

Repeated

7. Inner product by Euclidean method

Answer:

$$u \cdot v = u^t \cdot v$$

$$v \cdot u = v^t \cdot u$$

8. $\|v\|, \|u\|, \|v+u\|$ find out correctly without using Pythagorean theorem

Answer:

$$\|v\| = \sqrt{v_1^2 + v_2^2}$$

$$\|u\| = \sqrt{u_1^2 + u_2^2}$$

$$\|v+u\| = \|u\| + \|v\|$$

9. Find Eigen values of given matrix

Answer:

$$\mathbf{A} - \lambda \mathbf{I} = \begin{bmatrix} 2 & 3 \\ 3 & -6 \end{bmatrix} - \begin{bmatrix} \lambda & 0 \\ 0 & \lambda \end{bmatrix} = \begin{bmatrix} 2 - \lambda & 3 \\ 3 & -6 - \lambda \end{bmatrix}.$$

By definition, this matrix $\mathbf{A} - \lambda \mathbf{I}$ fails to be invertible precisely when its determinant is zero. Thus, the eigenvalues of \mathbf{A} are the solutions of the equation

$$\det(\mathbf{A} - \lambda \mathbf{I}) = \det \begin{bmatrix} 2 - \lambda & 3 \\ 3 & -6 - \lambda \end{bmatrix} = 0.$$

Recall that $\det \begin{bmatrix} a & b \\ c & d \end{bmatrix} = ad - bc$

So
$$\begin{aligned} \det(\mathbf{A} - \lambda \mathbf{I}) &= (2 - \lambda)(-6 - \lambda) - (3)(3) \\ &= -12 + 6\lambda - 2\lambda + \lambda^2 - 9 \\ &= \lambda^2 + 4\lambda - 21 \\ \lambda^2 + 4\lambda - 21 &= 0, \\ (\lambda - 3)(\lambda + 7) &= 0, \end{aligned}$$

so the eigenvalues of \mathbf{A} are 3 and -7 .

10. Let $[0, 2\pi]$ has the inner product $\int_0^{2\pi} f(t)g(t)dt$ show that $\cos t$ and $\sin t$ are orthogonal

No MCQ's were from past papers.

MCQ's were all related to vectors, orthogonal, saddle point.

subjects are following.

1.

vectors

Find distance between to

Answer:

$$\text{Distance}(\mathbf{u}-\mathbf{v}) = \sqrt{(u_1 - v_1)^2 + (u_2 - v_2)^2}$$

2. Find orthogonal with respect to euclidean Inner product eigen vector of A

3. Determinant of A Matrix, det A was given as 6

4. Inner Space vector, show that \mathbf{u} , \mathbf{v} are orthogonal vector

$$\mathbf{u}_1 \cdot \mathbf{v}_2 = 0, \mathbf{u}_2 \cdot \mathbf{v}_3 = 0, \mathbf{u}_3 \cdot \mathbf{v}_1 = 0$$

5. Saddle Point of dynamic system $X_{k+1} = Ax^k$

Answer:

The saddle point is if one eigenvalue is greater than '1' in magnitude and one is less than '1' in magnitude.

$$\det(A - \lambda I) = 0$$

6. Find Orthogonal Projection of y onto $\text{span}(u, u_2)$

Answer:

$$\hat{y} = \frac{y \cdot u}{u \cdot u} u, \text{ which is an orthogonal projection of } y \text{ onto } u.$$

7. Explain three applications of vector space.

The space shuttle's control systems

Engineering

Physics

Statistics

8. Compute orthogonal Project of $(1, -1)$ onto the line through $(-1, 3)$ and origin

Answer:

$$y = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$u = \begin{bmatrix} -1 \\ 3 \end{bmatrix}$$

$$\hat{y} = \frac{y \cdot u}{u \cdot u} u$$

$$\hat{y} = \frac{-4}{10} \begin{bmatrix} -1 \\ 3 \end{bmatrix} = \hat{y} = \begin{bmatrix} 2/5 \\ -6/5 \end{bmatrix}$$

$$y \cdot u = \begin{bmatrix} 1 \\ -1 \end{bmatrix} \cdot \begin{bmatrix} -1 \\ 3 \end{bmatrix} = -1 - 3 = -4$$

$$u \cdot u = \begin{bmatrix} -1 \\ 3 \end{bmatrix} \cdot \begin{bmatrix} -1 \\ 3 \end{bmatrix} = 1 + 9 = 10$$

9. Let $c[0, 2\pi]$ have inner product

10. For what values of h is the following system consistent??

MCQS 1 ya 2 past se the baqi sare new the bt easy they determinants ma se vectors mai se e.t.c

1 qn distance find out krna tha if u and v given,

Answer:

$$\begin{aligned} \text{dist}(u, v) &= \|u - v\| = \sqrt{(u - v) \cdot (u - v)} \\ &= \sqrt{(u_1 - v_1)^2 + (u_2 - v_2)^2 + (u_3 - v_3)^2} \end{aligned}$$

2nd qn least square solution findout krna tha

3rd one ka cramer rule apply krna tha

4th orthogonal wala tha

5th k ki value findout krni the if $|A|=6$ dia hua tha

6th orthonormal basis of subspace spanned wala tha

Answer:

$$u_1 \cdot u_2 = 0, u_2 \cdot u_3 = 0, u_3 \cdot u_1 = 0$$

7th integration wala tha