Science 2 Class Quiz

Total Marks: 50
Time: 1 hour

MCQs (15)

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1. Which of the following is true for a Skew-symmetric matrix? **(1)**

    a. $A^T = A$
    b. $A^T = -A$
    c. $A^{-1} = -A$
    d. $A^{-1} = A$

    Ans: b

2. Time complexity for the Gauss-Jordan Method is? **(1)**

    a. $O(n^2)$
    b. $O(n)$
    c. $O(n^3)$
    d. $O(nlogn)$

    Ans: c

3. A is an n*n non singular matrix. Select the incorrect option with respect to A. **(1)**

    a. det(A) = 0
    b. rank(A)=n
    c. None
    d. Both a and b

    Ans : a

4. The following matrix is a _____ matrix. **(1)**

4	-1
12	3

    a. Idempotent
    b. Orthogonal
    c. Involutory

    Ans: a

5. For a skew symmetric matrix, the diagonal elements are always zero. **(1)**

    a. True

b. False

Ans: a

6. A = 2 1
   3 x

   Is a singular matrix for which value of x? **(1)**

   a. 1
   b. 0
   c. 3/2
   d. 4

   Ans: c

7. System of linear equations are called consistent if they have: **(1)**

   a. No solution
   b. One solution
   c. One or more solutions

   Ans: c

8. If system of linear equations are in the form of AX = B, $B \neq 0$ then they are called _____? **(1)**

   a. Homogeneous
   b. Non-Homogenous

   Ans: b

9. If X is the condition number of matrix A and k is a scalar then what is the condition number of the matrix kA? **(1)**

   a. k*X
   b. X/k
   c. X
   d. X^k

   Ans: c

10. Which of the following is not a property of a Matrix Norm? **(2)**

    a. || kA || = |k|. ||A|| for any scalar k
    b. ||A+B|| ≤ ||A||+||B||
    c. ||AB|| ≤ ||A||.||B||
    d. None

    Ans: d

11. Let x be the solution to Ax=b and k be the condition number of the matrix A. Which of the following is correct? **(2)**

    a. $\frac{||\Delta x||}{||x||} \leq k.\frac{||\Delta b||}{||b||}$
    b. $\frac{||\Delta x||}{||x||} = k.\frac{||\Delta b||}{||b||}$
    c. $\frac{||\Delta x||}{||x||} \geq k.\frac{||\Delta b||}{||b||}$
    d. $\frac{||\Delta x||}{||x||} > k.\frac{||\Delta b||}{||b||}$

    Ans: a

12. $A = \begin{matrix} 2 & 1 \\ 1 & 2 \end{matrix}$

    Which of the following statements are false? **(1)**

    a. A is a symmetric matrix
    b. A is a sparse matrix
    c. A is a Positive definite matrix
    d. None

    Ans: b

13. U = [1 -2 0] is a vector. What is the 3-norm value of U. **(1)**

    a. 3
    b. 2.08
    c. 2
    d. 3.08

    Ans: b

Long Answer Questions (35)

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1. Solve the following system of equations by using Gauss-Jordan Elimination Method: **(10)**

$$a + b + 2c = -1$$
$$a + 3b - 6c = 7$$
$$2a - b + 2c = 0$$

    Ans: [1, 0, -1]

2. The 1-norm of a matrix is given as

$$\|A\|_1 = \max_{1 \le j \le n} \sum_{i=1}^{m} |a_{i,j}|$$

Find the condition number of the matrix A

$$A = \begin{bmatrix} 4 & 2 \\ -1 & 5 \end{bmatrix}$$ **(10)**

Ans: cond(A) = 42/22 = 1.909, ||A|| = 7 , ||A-1|| = 6/22

3. Solve the following system of equations using LU Decomposition method: **(15)**

$$x_1 + x_2 + x_3 = 1$$
$$4x_1 + 3x_2 - x_3 = 6$$
$$3x_1 + 5x_2 + 3x_3 = 4$$

Ans: [1, 0.5, -0.5]