Assignment 4

Due on 2025-10-14, 23:59 IST.

1. If one of the eigenvalues of $A_{nu}$ is zero, it implies:
   - The solution to $Ax=b$ system of equations is unique
   - The determinant of $A$ is zero
   - The solution to $Ax=0$ system of equations is trivial
   - The dimension of $A$ is nonzero

2. Which of the following is not involved in Gaussian elimination method? (1 point)
   - Elimination of Unknowns
   - Reduction to an upper triangular system
   - Finding unknowns by back substitution
   - Evaluation of cofactors

3. What is the value of $n_1$?
   - 1.625
   - 0.648
   - 0.6
   - None of these

4. The total number of multiplications/divisions required to apply Gaussian elimination method is:
   - $\frac{n(n-1)}{2}
   - $n^3$
   - $n^2$
   - $n+1$

5. What is the principle of LU factorization method? (1 point)
   - There exists an inverse for a singular matrix.
   - Determinant of an identity matrix is one.
   - Every square matrix can be expressed as a product of a lower triangular matrix and upper triangular matrix.
   - Every matrix can be expressed as a sum of a skew-symmetric matrix and symmetric matrix.

6. Apply LU factorization method for solving the following equations:
   $$3x + 2y + z = 6
   2x + 3y + z = 5
   3x + 4y + z = 7$$
   What is the value of $z$?
   - 1
   - 2
   - 3
   - None of these

7. Close the linear system
   $$2x + 3y = 1
   3x + 2y = 5$$
   What is the value of $x$ for which the system has all solutions?
   - 1
   - 2
   - 3
   - None of these

8. The LU factorization requires:
   - $L$ multiplication/divisions
   - $U$ subtraction
   - $L$ addition/subtractions
   - $U$ addition/subtractions

9. Which of the following matrices are diagonally dominant?
   - $\begin{bmatrix} 2 & -1 \\ 1 & 5 \end{bmatrix}$
   - $\begin{bmatrix} 0 & -1 \\ 1 & 5 \end{bmatrix}$
   - Both (a) and (b)
   - None of these

10. The Cholesky factorization of positive definite matrix:
    $$A = LDL^T = \begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix} \begin{bmatrix} 2 & 1 \\ 1 & 10 \end{bmatrix}$$
    What is the matrix $L$?
    - $\begin{bmatrix} 2 & 0 \\ 0.5 & 1 \end{bmatrix}$
    - $\begin{bmatrix} 2 & 0 \\ 0.5 & 10 \end{bmatrix}$
    - Both (a) and (b)
    - None of these