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Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Fall 2025
Course Code: MAT102; Course Title: Mathematics II
Sections: 44 (A-K), Teachers Initial: ZT, NRA, DK, MMH

Time: 1 Hour 30 Minutes **Marks: 25**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially]

1.	**Explain** Diagonal, Singular, Adjoint, Sparse, and Permutation matrix with an example.	5×1=5	CLO-1 L-2
2.	**a. Analyze** the nature of solution of the non-homogeneous system of linear equations. **b. Point out** the diagonal of a matrix having order $m \times n$. **c. Examine** the rank of $\frac{1}{5}I_5$.	3×1=3	CLO-2 L-4
3.	$A = \begin{pmatrix} 1 & 3 & -2 & 0 \\ 2 & 6 & -5 & -2 \\ 8 & 0 & 5 & 10 \\ 0 & 6 & 0 & 8 \end{pmatrix}$ $B = \begin{pmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{pmatrix}$ **a. Derive** the normal form of matrix A and comment about it's rank from the normal form. **b. Construct** the inverse of B **c. Determine** all the Eigen values and the Eigen vector related to the largest Eigen value of the matrix B.	4 3 5	CLO-3 L-3
4.	The present age of Momin and Chandan are in the ratio 2 : 1, and Chandan and Rayhan are in the ratio 2 : 3. Fifteen years hence, their (Momin and Chandan) ratio will be 7 : 5. Construct the system of linear equations from this scenario. Then, **Identify** the solution of the system.	5	CLO-4 L-4