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Daffodil International University

Faculty of Science & Information Technology
Department of Software Engineering
Midterm Examination, Spring 2026
Course Code: MAT102; Course Title: Mathematics II
Sections: 44 (A-K), Teachers Initial: MMH, ZT, DMMK, RAR, MSIM

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** Scaler, Symmetric, Hermitian, Involuntary and Permutation matrix with an example.	5×1=5	CLO-1 L-2
2.	a. **Analyze** the difference between identity and diagonal matrix. b. Point out the maximum possible rank of the matrix $A_{m\times n}$. c. **Explain** when a matrix becomes invertible.	3×1=3	CLO-2 L-4
3.	$A = \begin{pmatrix} -2 & 1 & 1 & 1 \\ 0 & 8 & -4 & 0 \\ 0 & 0 & 0 & 0 \\ 3 & 2 & -5 & 0 \end{pmatrix}$ $B = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}$		
	a. **Derive** the normal form of matrix A and comment about it's rank from the normal form.	4	CLO-3 L-3
	b. **Examine** the validity of the Cayley-Hamilton theorem for the matrix B and also compute B^{-1}.	4	
	c. **Determine** Eigen vector related to the largest Eigen value of the matrix B and also determine the spectrum of B^{-3}.	4	
4.	**Identify** the solution of the following system $\begin{cases} x+y+z=0 \\ -x+y-z=9 \\ 4x-7y+9z=1 \end{cases}$	5	CLO-4 L-4

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