



# Daffodil International University

Department of Software Engineering

Faculty of Science & Information Technology

Midterm Examination, Spring 2025

Course Code: MAT102; Course Title: Mathematics II

Sections: 43 (A-Q), Teachers Initial: MMH, MSU, MIA, NA

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, Involuntary, Orthogonal, Hermitian, and Nilpotent matrix with an example.                                                                                                                                                                                                                                              | 5×1=5       | CLO-1<br>L-2 |
| 2. | a. Analyze the nature of the trace of a completely non-zero Skew Hermitian matrix.<br>b. Point out a $5 \times 4$ matrix for which $REF=RREF=NF$ .<br>c. Examine the diagonal of $-2I_4 + \frac{1}{2}I_4$ .                                                                                                                            | 3×1=3       | CLO-2<br>L-4 |
| 3. | $A = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 3 & 0 & 2 & 2 \\ 1 & -1 & 2 & 1 \\ 1 & 0 & 1 & 1 \end{pmatrix} \quad B = \begin{pmatrix} 0 & 4 & 2 \\ -3 & 8 & 3 \\ 4 & -8 & -2 \end{pmatrix}$ a. Compute the rank of A.<br>b. Construct the inverse of B and verify it.<br>c. Determine all the Eigen values and Eigen vectors of the matrix B. | 3<br>4<br>5 | CLO-3<br>L-3 |
| 4. | The following diagram describes the traffic flow of a congested area of a city on some day. Construct the system of linear equations from this scenario. Then, Identify the solution of the system for the unknown flow rates. <div style="text-align: center;"> </div>                                                                | 5           | CLO-4<br>L-4 |