



# Daffodil International University

Faculty of Science & Information Technology  
Department of Computer Science and Engineering  
Final Examination, Summer-2026

Course Code: MAT 102, Course Title: Mathematics II

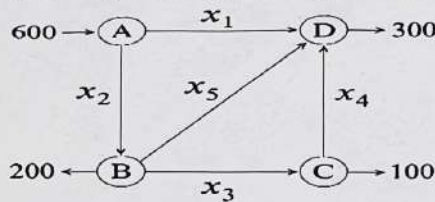
Level: 01 Term: 02 Batch: 71

Time: 2 Hours

Marks: 40

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. | a) | Given $M = \begin{pmatrix} 2 & 7 & -3 & 0 & 8 \\ -1 & 0 & 2 & -4 & 1 \\ 3 & -2 & 8 & 5 & 6 \\ 1 & 7 & -1 & -4 & 9 \end{pmatrix}$ . Identify REF and rank of the matrix M.                                                                                                                                                                                                                          | [3+1]   | CO2 |
|    | b) | Given $S = \begin{pmatrix} 2 & 4 & 0 \\ -1 & 4 & 3 \\ 3 & -5 & -9 \end{pmatrix}$ .<br>i) Organize the matrix S as the sum of a symmetric and a skew symmetric matrix.<br>ii) Construct $S^{-1}$ (Using Adjoint Matrix).<br>iii) Identify whether the matrix S is orthogonal or not.                                                                                                                | [3+5+1] |     |
| 2. |    | Figure shows the flow of traffic (in vehicles per hour) through a network of streets.<br><br>i) Discover a system of linear equations that represents this network.<br>ii) Examine the general solution of the SLE that describe the flow.<br>iii) Simplify the traffic flow when $x_4 = 100$ and $x_5 = 100$ . | [1+5+1] | CO3 |
| 3. |    | Given, $N = \begin{pmatrix} 4 & 3 & 0 \\ 6 & -3 & 0 \\ 7 & 5 & \frac{1}{2} \end{pmatrix}$ .<br>i) List out the eigenvalues of $(N^{-1})^T$ .<br>ii) Inspect the spectrum of $N^5$ and the trace of $N^{-4}$ .                                                                                                                                                                                      | [6+2]   |     |
| 4. | a) | Apply Row Echelon technique to test the linear dependency of S, where $S = \{(2, -5, 9, 5), (3, -3, 2, 6), (5, 1, -12, 8)\}$ in $R^4$ . If dependent then find a LDR among them and verify it.                                                                                                                                                                                                     | [5]     | CO4 |
|    | b) | $T_1(a, b, c) = (a - 2c, -b + 3c, a + b)$ ;<br>$T_2(a, b, c, d) = (a - 5b + c - d, a + 2c - 2d, b - c)$ ;<br>$T_3(a, b, c) = (a + 2b - 7c, a + c - 4b, bc - 8a)$ ;<br>i) Identify which are Linear Transformation.<br>ii) Construct $(T_1 \circ T_1) \circ T_2$ and $T_2 \circ T_1$ .                                                                                                              | [3+4]   |     |