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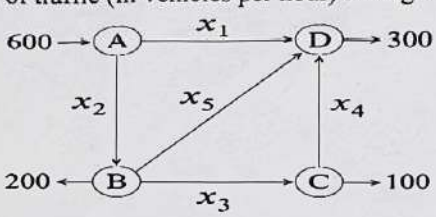
Daffodil International University

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 $S = \begin{pmatrix} 2 & 4 & 0 \\ -1 & 4 & 3 \\ 3 & -5 & -9 \end{pmatrix}$. i) Organize the matrix S as the sum of a symmetric and a skew symmetric matrix. ii) Construct S^{-1} (Using Adjoint Matrix). ii) 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.  i) Discover a system of linear equations that represents this network. ii) Examine the general solution of the SLE that describe the flow. iii) Simplify the traffic flow when $x_4 = 100$ and $x_5 = 100$.	[1+5+1]	CO3
3.		Given, $N = \begin{pmatrix} 4 & 3 & 0 \\ 6 & -3 & 0 \\ 7 & 5 & \frac{1}{2} \end{pmatrix}$. (i) List out the eigenvalues of $(N^{-1})^T$. (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)	$T_1(a, b, c) = (a - 2c, -b + 3c, a + b)$; $T_2(a, b, c, d) = (a - 5b + c - d,\ a + 2c - 2d,\ b - c)$; $T_3(a, b, c) = (a + 2b - 7c,\ a + c - 4b,\ bc - 8a)$; i) Identify which are Linear Transformation. ii) Construct $(T_1 \circ T_1) \circ T_2$ and $T_2 \circ T_1$.	[3+4]	