



# Daffodil International University

Faculty of Science & Information Technology  
Department of Computer Science and Engineering

Final Examination, Spring-2024

Course Code: MAT 102, Course Title: Mathematics II

Level: 01 Term: 02 Batch: 65

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 $P = \begin{bmatrix} 3 & -7 & 1 \\ 0 & 4 & -5 \\ 2 & -3 & 6 \end{bmatrix}$ . (i) Organize $P$ as a sum of symmetric and skew-symmetric matrix. (ii) Construct $P^{-1}$ .	[3+5]	CO2
	b)	Identify the Rank, the RREF and the NF of $M = \begin{bmatrix} 1 & 2 & -1 & 2 & 1 \\ 2 & 4 & 1 & -2 & 3 \\ 3 & 6 & 2 & -6 & 5 \end{bmatrix}$ .	[6]	
2.		The network in the figure shows the traffic flow (in vehicles per hour) over several one-way streets in the downtown area of a certain city during a typical lunch time. Analyze the flow and find the general solution of the system of equations that describes flow. 	[6]	CO3
3.		Given $M = \begin{bmatrix} -1 & 18 & 0 \\ 1 & 2 & 0 \\ 5 & -3 & -1 \end{bmatrix}$ . (i) List out the eigenvalues of $M^{-2}$ . (ii) Inspect the trace of $M^{-4}$ and the spectrum of $M^5$ .	[4+4]	CO3
4.	a)	Determine whether the vectors $(2, 1, 3, -1)$ , $(2, 3, 1, 2)$ , $(3, 2, 5, 6)$ and $(-2, -7, 3, -8)$ are linearly independent or dependent. Find a LDR among them and verify it.	[3+2]	CO4
	b)	$P(x, y, z) = (4x - 3z, 2x + y, -z)$ , $Q(x, y, z) = (y, x + 3z, z - x)$ , $R(x, y, z) = (3xy, x - y, x - 5y + z)$ , $S(x, y, z) = (x + y - z, 3y + z)$ . (i) Examine which are LT. (ii) Evaluate $Q \circ P$ and $P \circ S$ .	[4+3]	