



# Daffodil International University

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

Final Examination, Fall-2024

Course Code: MAT 102, Course Title: Mathematics II

Level: 01 Term: 02 Batch: 66

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 $A = \begin{bmatrix} 3 & -2 & 1 \\ 0 & 5 & -3 \\ 2 & -7 & 4 \end{bmatrix}$ .	[5+3+1]	CO2
		(i) Construct the inverse matrix $A^{-1}$ . (ii) Organize $A^{-1}$ as a sum of a symmetric matrix and a skew-symmetric matrix. (iii) Identify whether the matrix $A$ is orthogonal or not.		
	b)	Given the matrix $M = \begin{bmatrix} 3 & -2 & 4 & 7 \\ 2 & 1 & 0 & -3 \\ 2 & 8 & -8 & 2 \end{bmatrix}$ , identify the Rank, construct the Reduced Row Echelon Form (RREF) and the Normal Form (NF) of $M$ .	[5]	
2.		The figure below shows the traffic flow (vehicles per hour) through a network of streets. <div data-bbox="427 1020 776 1238" data-label="Diagram"> </div>	[2+3+1]	CO3
3.		Given $M = \begin{bmatrix} -5 & 0 & 0 \\ 9 & 2 & 0 \\ -1 & 4 & -3 \end{bmatrix}$ .	[4+4]	CO3
		(i) List out the eigenvalues of $M^{-2}$ and $(MM^{-1})^4$ . (ii) Inspect the trace of $M^5$ and the spectrum of $(M^{-3})^T$ .		
4.	a)	Assess the linear independence of the vectors $(1, 0, 2, 3)$ , $(0, 1, 4, 5)$ and $(1, 1, 6, 8)$ . If they are dependent, find a linear dependence relation and verify it.	[3+2]	CO4
	b)	$P(x, y, z, t) = (4x + y - 2z - 3t, 2x + y + z - 4t, 6x - 9z + 9t)$ , $Q(x, y) = (2xy, 5y, x)$ , $R(x, y, z) = (2x - y + 3z, x + 4y - 2z, -x + 2y + z)$ , $S(x, y, z) = (4x + y, x - z, z + y)$ . (i) Examine which are LT. (ii) Evaluate RoSoP and PoS.	[4+3]	