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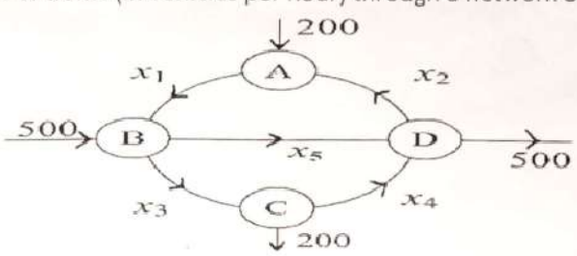
Daffodil International University

Faculty of Science & Information Technology
Department of Computer Science and Engineering
Final Examination, Summer-2025
Course Code: MAT 102, Course Title: Mathematics II
Level: 01 Term: 02 Batch: 68

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 $R = \begin{pmatrix} 2 & 4 & -6 & 8 & 0 \\ -1 & -2 & 3 & 0 & 1 \\ 3 & 6 & -9 & 10 & -2 \end{pmatrix}$. ii) Identify REF, RREF and rank of the matrix R.	[2+2+1]	CO2
	b)	Given $M = \begin{pmatrix} 3 & 4 & -1 \\ 1 & 0 & 3 \\ 2 & 5 & -4 \end{pmatrix}$. i) Construct M^{-1} (Using Adjoint Matrix). ii) Identify whether the matrix M is orthogonal or not.	[5+2]	
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 $x_5 = 500$.	[2+5+1]	CO3
3.		Given, $P = \begin{pmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{pmatrix}$. (i) List out the eigenvalues of $(P^{-1})^T$. (ii) Inspect the spectrum of P^5 and the trace of P^{-3}.	[6+2]	CO3
4	a)	Determine whether or not the vector (2,-5, 9) is a linear combination of the $(1,-3,2)$, $(2,-4,-2)$ and $(1,-5,7)$ in R^3.	[5]	CO4
	b)	$A(x,y,z) = (x+2y-9z, 3x-y+7z, -5x+y-2z)$; $B(x,y,z,t) = (x-y-2z+8t, 2x+y-7t, y-3t)$; $C(x,y,z) = (x-y-z, xy, yz-x)$; $D(x,y,z) = (2x-y, -x+3z, y-z)$ i) Explain which are Linear Transformation. ii) Evaluate DoAoB and AoD.	[4+3]	CO4

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