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Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall-2023
Course Code: MAT 102, Course Title: Mathematics II
Level: 01 Term: 02 Batch: 64

Time: 2 Hours **Marks: 40**

Answer All Questions

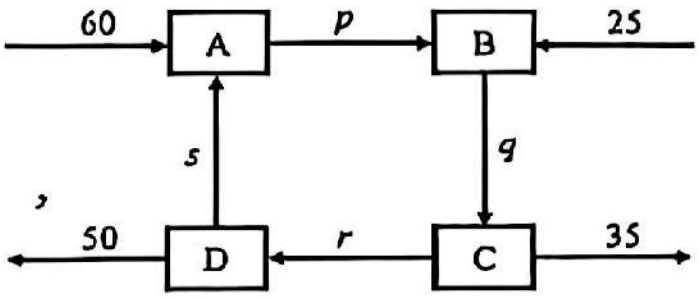
[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1. a) Given $M = \begin{bmatrix} 6 & 2 & 0 \\ -2 & -1 & 4 \\ 3 & -5 & 6 \end{bmatrix}$. [3+5+5] CO1

(i) Divide M into symmetric and skew-symmetric matrix.
(ii) Determine the Rank, the RREF and the NF of M.
(iii) Compute M^{-1}.

b) List examples: [2]
(i) an Orthogonal matrix (5×5). (ii) a Symmetric matrix (6×7).

2. a) The following figure describes the outskirts of a residential area. [3+4] CO4
Here p, q, r and s denote the number of vehicles passing everyday along given paths.
(i) Demonstrate the scenario by a SLE.
(ii) Evaluate p, q, r and s when there exists no congestion at the intersecting points.



b) Examine whether the vectors $(5,-2,4), (2,-3,5)$ and $(4,5,-7)$ are linearly independent or dependent. [3]

3. Given $M = \begin{bmatrix} 1 & 1 & 2 \\ -1 & 2 & 1 \\ 0 & 1 & 3 \end{bmatrix}$. [4+2+2] CO3

(i) Identify the eigenvalues of M.
(ii) Estimate the spectrum of M^{-5}.
(iii) Identify the trace of M^{-3}.

4. $P(x,y,z) = (2x, 4x-y, 3y-z)$, $Q(x,y,z) = (2x-y, xy+z, z-x)$, [4+3] CO4
$R(x,y,z) = (3x, x-y, 2x+y+z)$, $S(x,y,z) = (x+y-z, 2y+z)$.

(i) Examine which are LT.
(ii) Evaluate RoP and PoS.