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**Daffodil International University**

Department of Electrical and Electronic Engineering, Faculty of Engineering

Mid-Term Examination, Fall – 2023

Course Code: 0541-121 | Course Title: **Linear Algebra and Complex variable**

Section: **A, B, C, D** | Level-Term: L1-T2 | Teacher's Initial: MAA, SB

Full Marks: 25 | Date: 25 September, 2023 | Time: 1.5 Hours

[***Answer all the following questions***]

Q1. **Express** $(-2-3i)^5 - 7.3\,(4.9,\ 169^0)$ in Matrix form. Also, **locate** the complex number in the complex plane. **CO-3 C(4)** **[5]**

Q2. i) **Find** $BA - 4I_3$, where **CO-1 C(2)** **[2]**

$$A = \begin{pmatrix} -3 & 2 & -1 \\ 0 & 4 & 2 \\ 2 & \frac{1}{2} & -1 \end{pmatrix} \quad B = \begin{pmatrix} -3 & 1 & \frac{1}{4} \\ 1 & 0 & -4 \\ 0 & -2 & 0 \end{pmatrix}$$

ii) **Write** $A$ as the sum of a symmetric & a skew-symmetric matrix, where **CO-1 C(2)** **[3]**

$$A = \begin{pmatrix} \sin 90^\circ & (-1)^3 & 0 \\ \ln 1 & \int_{-\infty}^{0} e^x dx & -2 \\ |-2| & -\frac{7}{2} & 3! \end{pmatrix}$$

Q3. **Find** the REF, RREF and NF of the matrix **CO-1 C(2)** **[5]**

$$B = \begin{pmatrix} 1 & -2 & 2 & -1 \\ 3 & -6 & 6 & 1 \\ -1 & -2 & 3 & -2 \\ -2 & 4 & -4 & 2 \end{pmatrix}$$

Q4. i) **Find** the inverse of the matrix M. Also find $MM^{-1}$, Where **CO-1 C(2)** **[3+2]**

$$M = \begin{pmatrix} 1 & -\frac{2}{3} & 3 \\ 0 & 9 & 2 \\ -1 & 0 & -7 \end{pmatrix}$$

ii) **Check** the orthogonality for the matrix M, where $M = \begin{pmatrix} 1 & -\frac{\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & 1 \end{pmatrix}$

Q5. i) L is 13 ×32, M is 12 × 13 order matrix. **What** will be the dimension of $ML$ and $LM$? **CO-1 C(2)** **[1*5]**

ii) **Write** 1 difference between symmetric and orthogonal matrix.

iii) **How** many matrices we can find with 165 entries?

iv) **Find** the argument of the complex number $-9i$

v) **Write** a sparse and a dense matrix with 16 elements.