



Daffodil International University
Department of Electrical and Electronic Engineering
Faculty of Engineering
Final Examination, Fall – 2024

Course Code: 0541-121

Course Title: **Linear Algebra and Complex Variable**Section: **A, B, C**

Level-Term: L1-T2

Teacher's Initial: HRP

Full Marks: 40

Date: December 21, 2024

Time: 2 Hours

[Answer all the following questions]

- Q1. Illustrate the following with example** CO-1 [1*5]
(C2)
- (a) Spectrum (b) Singularity
(c) Characteristic Polynomial (d) Algebraic Multiplicity
(e) Analytic Function
- Q2.** CO-1 [10]
(C2)
- $A = \begin{pmatrix} 0 & 4 & 2 \\ -3 & 8 & 3 \\ 4 & -8 & -2 \end{pmatrix}$ is a matrix
- i) Identify the spectrum of A
ii) Identify the eigenvalues of A^T, A^3, A^{-1}, A^{-3} .
iii) Identify the eigenvectors of the matrix A.
- Q3.** CO-2 [6]
(C4)
- a) Examine whether the vector $(16, 1, -11, -23)$ is a linear combination of the vectors $(2, 0, -1, 1)$, $(-1, 1, 2, 0)$, $(1, 1, 0, -5)$ and $(1, 0, 0, -1)$ in $\mathbb{R}^4$.
- b) Examine the linear dependency of S, where CO-2 [4]
(C4)
- $S = \{(1, -2, 1), (2, 1, -1), (7, -4, 1)\} \subset \mathbb{R}^3$
- c) Examine whether the following mapping is linear or not and discover T^{-1} if it exists, where $T: \mathbb{R}^3 \rightarrow \mathbb{R}^3$ is given by $T(x, y, z) = (2x + 8y, 5y, -2z)$ CO-2 [5]
(C4)
- Q4.** CO-3 [6]
(C4)
- a) List out all the possible roots of
- i) $z^5 = -32$ ii) $z^3 = 8i$
- b) Using Cauchy's integral formula, analyze CO-3 [4]
(C4)
- $\oint \frac{ze^z}{z - 2i} dz$
- Where the Circle is i) $|z| = \frac{1}{2}$ ii) $|z| = 3$