International Islamic University Chittagong (IIUC)
Department of Electronic and Telecommunication Engineering
Midterm Examination

Program: **B.sc (Engg.)** Semester: **Autumn 2023**
Course Code: **Math-2307** Course Title: **Metrics, Linear System of Equations and Vector Analysis**
Total Marks: **30** Time: **1 Hour 30 Minutes**

(i) Answer all the questions. The figures in the right-hand margin indicate full marks.
(ii) Course Learning Outcomes (CLOs) and Bloom's Levels are mentioned in additional Columns.

Course Learning Outcomes (CLOs) of the Questions

CLO1 Discuss the basic idea of vector spaces, subspaces, Linear dependence and independence of vectors, Linear mappings, and Inner product spaces and be able to find the eigenvalues and eigenvectors of a square matrix using the characteristic polynomial and will know how to diagonalize a matrix. Applying these to solve the linear algebra in electric network.

CLO2 Get the basic understanding about scalar and vectors, dot Product, cross product derivative of vectors, vector integration. Analyze complex engineering problems be able to know gradient, divergence, curl and their physical significance and to learn the Greens, Gauss & Stocks theorem and their applications and be familiar with vector components in spherical and cylindrical systems.

Bloom's Levels of the Questions

Letter Symbols	**R**	**U**	**Ap**	**An**	**E**	**C**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Q1.	a)	Discuss with example of the followings: i) Scalar Matrix, ii) Rectangular Matrix, iii) Column Matrix, iv) Cofactor Matrix, v) Adjoint Matrix	CLO1	R	5
	b)	$A=\begin{pmatrix} 6 & 3 & 2 \\ 4 & -5 & 1 \\ 2 & 3 & 1 \end{pmatrix}$ Find the inverse matrix of the above matrix A.	CLO1	Ap	5
Q2.	a)	Apply the Cremer's rule of the following system of equations: $4x-3y+2z=10;\quad 3x+6y-4z=15;\quad 5x+2y+3z=5$	CLO1	Ap	5
	b)	Apply the Inverse rule of the following system of equations: $4x-6y=30;\quad 6x+10y=20;$	CLO1	E	5
Q3.	a)	Evaluate the characteristic roots of the following matrix: $A=\begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$	CLO1	E	5
	b)	If, $A=\begin{pmatrix} 4 & 6 & 3 \\ 2 & 3 & 4 \\ 1 & 2 & 5 \end{pmatrix}$ then Show that $AI=IA=A$	CLO1	C	5
		OR	CLO1		
Q3.	a)	Apply the Inverse rule of the following system of equations: $2x-4y+z=25;\quad 3x+2y-z=20;\quad 4x+5y+2z=15$	CLO1	Ap	5
	b)	Create the rank of the following matrix: $A=\begin{pmatrix} 1 & 2 & 3 & 2 \\ 2 & 3 & 5 & 1 \\ 1 & 3 & 4 & 5 \end{pmatrix}$	CLO1	C	5