THE OPEN UNIVERSITY OF SRI LANKA

B.Sc/B.Ed., Continuing Education Degree Programme

Applied Mathematics – Level 04

ADU4303/ADE4303 – Applied Linear Algebra & Differential Equations

Open Book Test (OBT) – 2023/2024

DURATION: ONE (01)–HOUR

Date:29.12.2023.   **Time: 09.00a.m.-10.00 a.m.**

ANSWER **ALL** QUESTIONS.

1. Without expanding, evaluate the determinant:

$$\begin{vmatrix} \sin\alpha & \cos\alpha & \sin(\alpha+\delta) \\ \sin\beta & \cos\beta & \sin(\beta+\delta) \\ \sin\gamma & \cos\gamma & \sin(\gamma+\delta) \end{vmatrix}.$$

2. Find the inverse of the following matrix:

$$\begin{pmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{pmatrix}$$

3. Reduce the following matrix to the normal form $\begin{pmatrix} I_r & 0 \\ 0 & 0 \end{pmatrix}$ and hence determine its rank:

$$\begin{pmatrix} 1 & -1 & 2 & -3 \\ 4 & 1 & 0 & 2 \\ 0 & 3 & 0 & 4 \\ 0 & 1 & 0 & 2 \end{pmatrix}$$

4. Discuss the consistency of the following system of simultaneous equations:

$-2x+y+z = a$

$x-2y+z = b$

$x+y-2z = c$

Obtain the complete solution for the consistent case.

5. Determine the eigen values and eigen vectors of the matrix

$$A = \begin{pmatrix} 2 & 1 & 0 \\ 0 & 1 & -1 \\ 0 & 2 & 4 \end{pmatrix}$$