



THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. /B.Ed DEGREE PROGRAMME - LEVEL 04

OPEN BOOK TEST-2015/2016

APU2144/APE4144 –Applied Linear Algebra and Differential Equations

DURATION: ONE HOUR

Date:08.10. 2016.

Time:01.00 p.m. –02.00 p.m.

ANSWER ALL QUESTIONS.

1. (i) Let $A = \begin{bmatrix} 2 & 3 & 4 \\ 4 & 3 & 1 \\ 1 & 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$.

Prove or disprove that $AB = BA$.

(ii) Find the inverse of the following matrix A using elementary transformations

where $A = \begin{pmatrix} 1 & 3 & 3 \\ 1 & 4 & 3 \\ 1 & 3 & 4 \end{pmatrix}$.

Hence find the solution of the following system of equations:

$$x + 3y + 3z = 2$$

$$x + 4y + 3z = 1$$

$$x + 3y + 4z = 3.$$

(iii) Find non-singular matrices P and Q such that PAQ is in the normal form,

$$\text{where } A = \begin{pmatrix} 1 & 1 & 1 \\ 1 & -1 & -1 \\ 3 & 1 & 1 \end{pmatrix}.$$

2.(i) Find the rank of the matrix B where

$$B = \begin{pmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{pmatrix}.$$

(ii) Determine the characteristic roots and corresponding characteristic vectors of the matrix A

$$\text{where } A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{pmatrix}.$$

Hence find the characteristic roots of A^2 and A^4 .