

THE OPEN UNIVERSITY OF SRI LANKA  
B.Sc. DEGREE PROGRAMME  
LEVEL 04-PURE MATHEMATICS  
CLOSED BOOK TEST-2010/2011  
PUU 2142-Linear Algebra



DURATION: ONE AND HALF (1 ½) HOURS

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Date: 12 October, 2010.

Time: 4.00 pm –5.30 pm

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ANSWER ALL QUESTIONS.

1. (i) Solve the following system of equations.

$$x + 2y - 5z + 2w = -2$$

$$3x - y + 2z + 4w = 19$$

$$4x + y - 3z + 6w = 17$$

$$2x - 3y + 7z + 2w = 21$$

(ii) If  $a, b, c, p, q$  and  $r$  are real numbers, find the conditions under which the equations

$$px + qy + rz = b - c$$

$$qx + ry + pz = c - a$$

$$rx + py + qz = a - b$$

are consistent.

2. (i) If  $A = \begin{pmatrix} 3 & 1 \\ 1 & 2 \end{pmatrix}$  express  $(5A^5 - 3A^4 + A^2 - 5I)$  as a linear polynomial in  $A$ .

(ii) Find the eigen vectors of the matrix  $A = \begin{pmatrix} 1 & 3 & 5 \\ 0 & -7 & 2 \\ 0 & 0 & 4 \end{pmatrix}$ .

3 (i) If  $A$  is the matrix  $\begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$ , find an orthogonal matrix  $P$  such that  $P'AP$  is a diagonal matrix,  $P'$  being the transpose of  $P$ .

(ii) Transform the quadratic form  $(3x_1^2 + 5x_2^2 + 3x_3^2 - 2x_2x_3 + 2x_1x_3 - 2x_1x_2)$  to canonical form by orthogonal transformation.