# ELIZADE UNIVERSITY
# ILARA-MOKIN, ONDO STATE

## FACULTY: BASIC AND APPLIED SCIENCES
## DEPARTMENT: MATHEMATICS AND COMPUTER SCIENCE
## 2nd SEMESTER EXAMINATION
## 2017 / 2018 ACADEMIC SESSION

**COURSE CODE:** MTH 204

**COURSE TITLE:** Linear Algebra II

**COURSE LEADER:** Dr. O.A. Adesanya

**DURATION:** 2 Hours

HOD's SIGNATURE

**INSTRUCTION:**

Candidates should answer any FOUR (4) Questions.

Students are warned that possession of any unauthorized materials in an examination is a serious assessment offence

Students are permitted to use ONLY a scientific calculator.

**Question 1**

(a) When are two linear systems of equations in same variables said to be Equivalent?

(b) When is a matrix $A$ said to be row equivalent to a matrix $B$ ?

(c) What is a Pivot position of a matrix $A$ ?

(d) Using elementary row operations find all solutions for the following linear system of equations :

$$x + 2y - z = 1$$
$$2x + y + 4z = 2$$
$$3x + 3y + 4z = 1$$

**Question2.** What does it means when we say a linear system of equations is **CONSISTENT?**
Solve the following linear system of equations

$$x_3 - x_4 + 2x_5 + x_6 = 0$$
$$3x_1 + 6x_2 + 3x_4 - 3x_5 + 2x_6 = 7$$
$$x_1 + 2x_2 + x_4 - x_5 = 1$$
$$2x_1 + 4x_2 - 2x_3 + 4x_4 - 6x_5 - 5x_6 = -4$$

**Question3.** Show that $X = \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ is an eigen vector of $A = \begin{bmatrix} 2 & 0 & 1 \\ -1 & 4 & -1 \\ -1 & 2 & 0 \end{bmatrix}$ corresponding to $\lambda = 1$.

(b) Let $A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & -1 & 4 \end{bmatrix}$. Find eigen values and bases for each eigen space.

**Question 4.** When is a square matrix $A$ said to be similar to another square matrix $B$?

$$\text{Let } A = \begin{bmatrix} 1 & 1 & 0 \\ 0 & 2 & 0 \\ 0 & -1 & 4 \end{bmatrix} \text{ find } B = P^{-1}A$$

**Question 5.**

(a) Define the following concepts: (i) Bilinear form  (ii) Quadratic form.

(b) Under what condition(s) do we have a quadratic form to be (i) Positive definite. (ii) Negative semi –definite.

(c) Let $u = (x_1, x_2, x_3)$ and $v = (y_1, y_2 y_3,)$ and
$$f(u, v) = 3x_1 y_1 - 2x_1 y_2 + 5x_2 y_1 + 7x_2 y_2 - 8x_2 y_3 + 4x_3 y_2 - x_3 y_3$$
Express $f$ in matrix notation.

**Question 6.**

(a) When is a matrix $B$ said to be Congruent to another matrix $A$ ?

(b) Find the symmetric matrix $A$ belonging to the quadratic polynomial
$$q(x, y, z) = 2x^2 - 8xy + y^2 - 16xz + 14yz + 5z^2$$
Hence determine the matrix $P$ such that $P^T AP$ is a diagonal matrix .

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