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(Knowledge for Development)

KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS

2016/2017 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

SPECIAL/SUPPLEMENTARY EXAMINATION

FOR THE DEGREE OF BACHELOR OF EDUCATION AND BACHELOR OF SCIENCE

MATHEMATICS

COURSE CODE: **MAT 102**

COURSE TITLE: FOUNDATION MATHEMATICS II

DATE: 14/9/17 **TIME:** 3 PM -5 PM

INSTRUCTIONS TO CANDIDATES

Answer Question One and Any other TWO Questions

TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over.

QUESTION ONE (30 MARKS)

(a) Find the angle between two vectors $2i - 5j - 7k$ and $-i + 4j - 6k$ (6 mks)

(b) Given $A = \begin{bmatrix} 2m & m \\ -3 & m \end{bmatrix}$ has determinant of 9 find m (4 mks)

(c) If $\boldsymbol{a} = 2i + 5j = 3k$ and $\boldsymbol{b} = i = j + 2k$ evaluate $2\boldsymbol{b}.(\boldsymbol{a} \times \boldsymbol{b})$ (5 mks)

(d) Find the solution of the following system of linear equations using augmented matrices (7 mks)

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

$$x + 2y + z = 0$$

$$3x - 2z = 5$$

(e) Find P if $(P^T - 4I)^{-1} = \begin{bmatrix} 3 & 1 \\ -1 & 0 \end{bmatrix}$ (5 mks)

(f) Given that $A = \begin{bmatrix} 2 & 4 & 6 \\ 3 & 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 6 \\ 4 & 1 \\ 10 & 0 \end{bmatrix}$ find $(A + B^T)^T$ (3 mks)

QUESTION TWO (20 MARKS)

(a) Find the projection of $-i - 2j + 2k$ on $5i - j - 3k$ (4 mks)

(b) Show that $\|a \times b\| = \|a\|\|b\| sin\theta$ (5 mks)

(c) Reduce the system into row-echelon form hence by backward substitution solve it

$$x + y + z = 2$$
$$-x + 3y + 2z = 8$$
$$4x + 5y + z = 6$$ (5 mks)

(d) Given that $A = \begin{bmatrix} 1 & 2 \\ 5 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 2 \\ 5 & -1 \end{bmatrix}$
Prove that $\det(AB) = \det A \det B$ (6 mks)

QUESTION THREE (20 MARKS)

(a) Find the inverse of the matrix $\begin{bmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ -6 & 2 & 3 \end{bmatrix}$ (10 mks)

(b) Compute the adjoint of P given

$$\begin{bmatrix} 1 & 3 & -2 \\ 0 & 1 & 5 \\ -2 & -6 & 7 \end{bmatrix}$$ (10 mks)

QUESTION FOUR (20 MARKS)

(a) Use Cramer's rule to find x_1, x_2, and x_3, (10 mks)

$$5x_1 + x_2 - x_3 = 4$$

$$9x_1 + x_2 - x_3 = 1$$

$$5x_1 - x_2 + 5x_3 = 2$$

(a) Compute the determinant of $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 1 & 1 \\ -1 & 3 & 0 \end{bmatrix}$ (5 mks)

(g) Using examples define (4 mks)

(i) A matrix

(ii) A vector

QUESTION FIVE (20 MARKS)

(b) Given $p = \langle 3, -2, -1 \rangle$ and $q = \langle 4, -3, 2 \rangle$ compute

(i) $p \times q$ (3 mks)

(ii) $q \times 2p$ (4 mks)

(c) If $detA = 5$ and $\det B = 6$ calculate $det(A^3B^{-1}A^TB^2)$ (5 mks)

(d) Determine if the two vectors are parallel, orthogonal or neither

$3i - 2j + 3k$ and $5i + 4j - 2k$ (3 mks)

(b) Compute the rank of $\begin{bmatrix} 1 & 2 & 1 & 1 \\ 2 & 3 & 0 & 5 \\ 3 & 5 & 1 & 4 \end{bmatrix}$ (6 mks)