TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MEDICAL ENGINEERING

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN MEDICAL ENGINEERING

AMA2250: ENGINEERING MATHEMATICS III

END OF SEMESTER EXAMINATION

SERIES: AUGUST 2017

TIME: 2HOURS

DATE: 11Sep2017

Instructions to Candidates
You should have the following for this examination
-*Answer Booklet, examination pass and student ID*
This paper consists of **FIVE** questions.
Attemptquestion ONE (Compulsory) and any other TWO questions.
Do not write on the question paper.

Question ONE (COMPULSORY)

(a) Calculate the product [A][B][C] by
      i). finding [T] = [A][B] and then [T][C], and
      ii). finding [T] = [B][C] and then [A][T] where:

$$[A] = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}, \quad [B] = \begin{bmatrix} 6 & 5 \\ 4 & 3 \\ 2 & 1 \end{bmatrix}, \quad [C] = \begin{bmatrix} -1 & -2 \\ -3 & -4 \end{bmatrix}$$

      iii). Calculate [A][B] of the two matrices given above and then take the transpose of product matrix. Is it equal to the product of $[B]^T[A]^T$?   (18 marks)

(b) Prove that the triangle formed by the points $(-3; 5; 6)$; $(-2; 7; 9)$ and $(2; 1; 7)$ is a 30°; 60°; 90° triangle.   (12 marks)

Question TWO

(a) Define the following terms as used in matrices:
      i). Null Matrix
      ii). Transpose Matrix
      iii). Identity matrix
      iv). Singular matrix   (4 marks)

(b) For the system of equations

$x_1 + 2x_2 + 3x_3 = 14$
$x_1 + 3x_2 + 4x_3 = 19$
$x_1 + 4x_2 + 3x_3 = 18$
compute the unknowns x_1, x_2 and x_3 using the inverse matrix method.   (16 marks)

Question THREE

(a) Use Cramer's rule to solve the equations:

$3x + 2y - z = 0$
$2x - y + z = 1$
$x - y + 2z = -1$ (12 marks)

(b) If $p = 2i + j - k$ and $q = i - 3j + 2k$ determine:

(i) $p \bullet q$ (ii) $p + q$ (iii) $|p + q|$ (iv) $|p| + |q|$ (8 marks)

Question FOUR

    (a) If $p = 4i + j - 2k,\ q = 3i - 2j + k$ and $r = i - 2k$ find

        i). $(p - 2q) \times r$

        ii). $p \times (2r \times 3q)$ (12 marks)

    (b) Find the direction cosines of $3i + 2j + k$ hence show that $cos^2\alpha + cos^2\beta + cos^2\gamma = 1$

                                                                     (8 marks)

Question FIVE

    (a) Evaluate, in polar form $2\angle30° + 5\angle-45° - 4\angle120°$ (8 marks)

    (b) Given $Z_1 = 2 + j4$ and $Z_2 = 3 - j$ determine

        i). $Z_1 + Z_2$,

        ii). $Z_1 - Z_2$,

        iii). $Z_2 - Z_1$ and show the results on an Argand diagram   (12 marks)