MACHAKOS UNIVERSITY

University Examinations for 2021/2022 Academic Year

DIRECTORATE OF TVET

SECOND YEAR FIRST TERM EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND ELECTRONIC ENGINEERING

CERTIFICATE IN AUTOMOTIVE ENGINEERING

ENGINEERING MATHEMATICS II.

DATE: 21/7/2022 **TIME: 11.30-2.30 PM**

INSTRUCTIONS
Answer all questions

1. Using the substitution method solve the networks given below

$$2I_1 + 4I_2 + 3I_3 = 4$$

$$-4I_1 - 2I_2 + I_3 = 2$$

$$3I_1 + 5I_2 + 2I_3 = -1$$ (8 marks)

2. Using binomial theorem:

a) Expand upto the 4^{th} term the following expression $(3x + 3y)^7$ (5 marks)

b) Hence determine the 6^{th} term of these expansion (3 marks)

3. Given the matrices $A = \begin{bmatrix} -2 & 1 & 2 \\ 0 & 1 & 1 \\ 1 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 & 1 \\ 1 & 1 & 1 \\ 3 & 1 & -1 \end{bmatrix}$

a) Determine $(A + B)^T$ (4 marks)

b) Determine $(B - A)^T$ (4 marks)

4. Given the vectors $A = 10i + j + 2k$, $B = 2i + 3j + 4k$ and $C = 5i + 2j + 3k$

Determine

a) $A \bullet (B \times C)$ (4 marks)

b) $A \times B$ (4 marks)

5. a) given the matrices

$$A=\begin{bmatrix}13 & 7\\ -6 & 4\end{bmatrix}, B=\begin{bmatrix}9 & 8\\ 12 & 10\end{bmatrix} \text{ and } C=\begin{bmatrix}11 & -7\\ -8 & 5\end{bmatrix}$$

Find

i. $3A+B-C$

ii. AC

iii. AC^{-1} (9 marks)

b) use the results obtained in (iii) above to solve

$$87x-56y=-50$$
$$62y-98x=52$$

(5 marks)

c) A mason used three bags of lime and 2 bags of cement in day one and 5 bags of lime and 3 bags of cement in day two during plastering. If the cost of lime and cement in day was ksh3050 and in day two was ksh4,800. Use the matrix method to find the cost of lime and cement. (6 marks)

6. a) Given that vector $\vec{A}=A_1i+A_2j+A_3k$ and $\vec{B}=B_1i+B_2j+B_3k$ show that

$$\vec{A}\bullet\vec{B}=A_1B_1+A_2B_2+A_3B_3$$ (4 marks)

b) Given vectors:

$$A=3i+2j$$
$$B=8i+5j$$

Find the magnitude of the directional vector $3\vec{A}+\vec{B}$ (6 marks)

7. a) solve the following simultaneous equation using substitution method

$$3x+2y=12$$
$$4x-3y=8$$

(6 marks)

b) Using completing square method solve $2x^2+4x-5=0$ (4 marks)