UNIVERSITY EXAMINATIONS 2019/2020 ACADEMIC YEAR

**SCHOOL OF PURE AND APPLIED SCIENCES**

**DEPARTMENT OF MATHEMATICS AND STATISTICS**

**Examinations for Certificate in   Electrical Engineering**

**ECU 00201 MATHEMATICS IV**

**Year 2 semester 1**

**Instructions**

**Answer question ONE and any other TWO questions**

**QUESTION ONE          (30mks)**

a) Define the following terms as used in probability

| | | |
|---|---|---|
| i) | Event | (1mks) |
| ii) | Sample space | (1mks) |
| iii) | experiment | ( 1mks) |

b) Find the two values of x for which the matrix $\begin{bmatrix} x & 3x + 3 \\ 2 & x + 1 \end{bmatrix}$

 has no inverse                                        (4mks)

c)  A ball is drawn at random from a box containing 6red balls ,4white balls, and 5 blue balls. Determine the probability that it is

i)red

ii)white

iii)blue

iv)not red

v)red or white

(5mks)

c) If $E_1$ the event drawing an ace from a deck of cards and $E_2$ is the event drawing a spade from a deck of cards, Find the probability of drawing either an ace or a spade or both.
(3mks)

d) Given $A = \begin{bmatrix} 6 & 6 & -3 \\ -3 & 6 & 6 \\ 6 & -3 & 6 \end{bmatrix}$ verify that $AA^{-1} = \lambda I$   where $I$ is an identity matrix and $\lambda$ is a constant                                                                 (6mks)

e)  Mary bought 8 books and 5 pens at a total cost of Ksh 271 from a bookshop, Ann bought 14 books and 21 pens from the same bookshop at a total cost of Ksh 707. Using matrices determine the cost of each item

(4mks)

f) Given the following frequency distribution table calculate mean of the data

| AGE | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|
| No. of students | 2 | 5 | 13 | 7 | 3 |

(5mks)

**QUESTION TWO**

a)  Given the matrices $A = \begin{bmatrix} 3 & -2 \\ 4 & 0 \end{bmatrix}$ $B = \begin{bmatrix} 5 & 7 \\ 2 & 3 \end{bmatrix}$ $C = \begin{bmatrix} 3 & 2 \\ 2 & 5 \end{bmatrix}$

i)      Show that $A(B + C) = AB = AC$

ii)       determine $B^{-1}C$                                                            (14mks)

b)  The matrix $\bar{x} = \begin{bmatrix} a \\ b \end{bmatrix}$ satisfies the relationship $ABX = C$ where

$$A = \begin{bmatrix} -2 & 3 \\ 3 & -5 \end{bmatrix} \qquad B = \begin{bmatrix} 4 & 5 \\ 3 & 2 \end{bmatrix} \text{ and } C = \begin{bmatrix} 3 \\ 18 \end{bmatrix}$$

Evaluate a and b                                                                        (6marks)

**QUESTION THREE**

a)  Given the matrices

$$A = \begin{bmatrix} 2 & 1 & -1 \\ -2 & 3 & 1 \\ 4 & 5 & -3 \end{bmatrix} \qquad B = \begin{bmatrix} 1 & 3 & 1 \\ 2 & -1 & -1 \\ 0 & 1 & 3 \end{bmatrix}$$

Evaluate

i)      $BA$                                                                                      (5MKS)

ii)     $(BA)^{-1}$                                                                          (15mks)

## QUESTION FOUR

The data below represents resistance in ohms of the resistors from a factory

| Resistance in Ohms | 15-19 | 20-24 | 25-29 | 30-34 | 35-39 | 40-44 |
|---|---|---|---|---|---|---|
| Frequency | 10 | 20 | 17 | 36 | 23 | 10 |

a) using assumed mean method calculate the

        i) mean

        ii)variance

        iii)standard deviation                         (10mks)

b) Determine the i) mode

        ii)median                                    (10mks)

## QUESTION FIVE

a)  One bag contains 4white marbles and 2 black marbles. Another contains 3 white marbles and 5 black marbles. If one ball is drawn from each bag at random, find the probability that

  i)both are white

  ii)both are black

iii)one is white and one is black                                          (5mks)

b) The table below show the frequency distribution of marks obtained by students in a mathematics class

| marks | 20-25 | -25-30 | 30-35 | 35-40 | 40-45 | 45-50 |
|---|---|---|---|---|---|---|
| frequency | 2 | 14 | 29 | 43 | 33 | 9 |

Calculate the mode and the median of the data                (10mks)

c)Solve the simultaneous equations using matrices

$$2x - y = 4$$
$$3x - 2y = -2$$                                                          (5mks)