



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 6 red balls, 4 white 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 λ 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 $AB\bar{x} = C$ where

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

Evaluate a and b

(6marks)

QUESTION THREE

a) Given the matrices

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

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 4 white 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 shows 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

$$\begin{aligned}2x - y &= 4 \\3x - 2y &= -2\end{aligned}$$

(5mks)