



# MACHAKOS UNIVERSITY

University Examinations 2019/2020

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

CERTIFICATE IN ELECTRICAL AND AUTOMATIVE ENGINEERING (TVET)

1601/103: MATHEMATICS 1

DATE: 29/10/2020

TIME: 11:30 – 2:30 PM

## INSTRUCTIONS:

Answer all questions

Show all your working clearly.

## QUESTIONS ONE

- a) Convert
- $1046.24_8$  to denary
  - $465_{\text{ten}}$  into duodemial (5 marks)
- b) Add  $243_7$ , to  $26_7$ , and multiply the result by  $35_7$  (5 marks)
- c) Solve the following equations
- $\text{Log}(5x + 75) - 2 \log 3 = \log(2x - 9)$
  - $32^{x-3} \times 4^{x+3} = 128 \div 2^x$  (10 marks)

## QUESTION TWO

a) Given  $\mathbf{P} = \begin{bmatrix} 2 & 5 \\ 7 & -3 \end{bmatrix}$ ,  $\mathbf{Q} = \begin{bmatrix} 1 & 4 \\ 0 & 6 \end{bmatrix}$  and  $\mathbf{R} = \begin{bmatrix} 9 & -1 \\ 3 & 8 \end{bmatrix}$

Determine

- $2\mathbf{P} + 3\mathbf{Q} - \mathbf{R}$
- $(\mathbf{QP})\mathbf{R}$
- $\mathbf{P}^T$  (8 marks)

b) Use matrix method to solve the following simultaneous equations

$$3x - 3y - 3 = 0$$

$$4y + 2x = 8$$

(8 marks)

c) If the matrix  $\begin{bmatrix} x & 4 \\ 1 & x \end{bmatrix}$  is singular, find possible

Values of x

(4 marks)

### QUESTION THREE

a) Find the sum of the following series

$$17 + 17\frac{1}{4} + 17\frac{1}{2} + \dots \text{to 21 terms}$$

(4 marks)

b) Given that  $2 + b + 32 + \dots$  form a G.P;

Determine

i. The Value of B

ii. The Common Ratio

iii. The sum of the first 10 terms of the G.P

(6 marks)

c) Determine the stated term in the following series

i)  $11 + 8 + 5 + \dots$  the 14<sup>th</sup> term

ii)  $0.75 + 1.5 + 3 + \dots$  the 10<sup>th</sup> term

(6 marks)

d) If Kshs 78.60 = 1 US Dollar and Kshs 125.15 = £1. Find;

i) How many dollars would a traveller, with Kshs half a million receive for the journey.

ii) How much an importer of a machine from England would pay if it costs £15,000.

(4 marks)

### QUESTION FOUR

a) Solve the following equations

i)  $\frac{2}{x-5} = \frac{3}{x-1}$

ii)  $2x^2 + x = 3$

iii)  $6a + 3b = 0$

$$4a = 6 - 5b$$

(10 marks)

b) Solve the matrix equation  $\mathbf{AY} = \mathbf{B}$  where

$$\mathbf{A} = \begin{bmatrix} 7 & 5 \end{bmatrix} \text{ and } \mathbf{B} = \begin{bmatrix} 1 & -1 \end{bmatrix} \text{ to find the matrix } \mathbf{Y}$$

c)  $\mathbf{N}$  is the matrix  $\begin{bmatrix} 1/2 & 3/2 \\ -3/2 & 1/2 \end{bmatrix}$ ,

determine

i)  $|\mathbf{N}|$                       ii)  $\mathbf{N}^{-1}$                       iii)  $\mathbf{N}^T$                       (3 marks)

### QUESTION FIVE

a) The 5<sup>th</sup> term of an A.P is 82 and the 12<sup>th</sup> term is 103. Determine

i) The first term and the common difference

ii) The sum of the first 18 terms                      (6 marks)

b) Given the series  $27 + 18 + 12 + \dots$  find,

i) The common ratio

ii) The sum to infinity                      (4 marks)

c) The first, fifth and seventh terms of an A.P correspond to the first three consecutive terms of a decreasing G.P. The first term of each progression is 64, the common difference of the A.P is  $d$  and the common ratio of the G.P is  $r$ .

i) Write down two equations involving  $d$  and  $r$  and find their values

ii) Using the value(s) of  $d$  and  $r$  in (i) above find the sum of first 10 terms of the A.P and then of the G.P                      (10 marks)