

1601/103
1602/103
MATHEMATICS I
June/July 2019
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

**CRAFT CERTIFICATE IN ELECTRICAL AND
ELECTRONIC TECHNOLOGY
(POWER OPTION)
(TELECOMMUNICATION OPTION)**

MODULE I

MATHEMATICS I

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;

Mathematical tables/Scientific calculator.

*Answer any **FIVE** of the following **EIGHT** questions in the answer booklet provided.*

All questions carry equal marks.

All necessary working must be clearly shown.

Maximum marks for each part of a question are as indicated.

Candidates should answer the questions in English.

This paper consists of 5 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.

1. (a) (i) Determine the value of:

$$\frac{7}{6} \text{ of } \left(3\frac{1}{2} - 2\frac{1}{4}\right) + 5\frac{1}{8} - \frac{3}{16} - \frac{1}{2} \quad (5 \text{ marks})$$

- (ii) Convert 0.33 to a fraction. (4 marks)

- (b) The third, fourth and fifth terms of a geometric progression are $t + 4$, $t + 10$ and $t + 20$ respectively. Determine the:

- (i) common ratio;
(ii) first term;
(iii) sum of the first 12 terms.

(11 marks)

2. (a) Solve the equations:

- (i) $\log(x^2 - 3) - \log x = \log 2$;
(ii) $2^x = 3$ correct to three decimal places.

(8 marks)

- (b) The heights of 40 students to the nearest centimeter were recorded as in table 1.

Table 1

Height (cm)	x	f
131 - 140	135.5	3
141 - 150	145.5	4
151 - 160	155.5	7
161 - 170	165.5	11
171 - 180	175.5	9
181 - 190	185.5	5
191 - 200	195.5	1

for $\bar{x} = 165.5$ $f(\bar{x} - x)^2$ of

Given that the assumed mean is 165.5.

- (i) Complete the table;
(ii) Calculate the mean height;
(iii) Determine the standard deviation of the distribution.

(12 marks)

3. (a) Convert:

(i) 47_{10} to a binary number;

(ii) 100110101_2 to a denary number.

(6 marks)

(b) Evaluate the expression $\left(\frac{8}{27}\right)^{-\frac{2}{3}} \times (16)^{\frac{1}{2}} \div (81)^{\frac{1}{4}}$.

(6 marks)

(c) Use the inverse matrix method to solve the simultaneous equations:

$$4x - 3y = 17$$

$$x + y = -1$$

(8 marks)

4. (a) Solve the equations:

(i) $2^{x+1} = 3^{2x-5}$;

(ii) $\frac{1}{2} \log 4 = \log x$.

(10 marks)

(b) Given the numbers 24, 32, 48 and 56 find the

(i) LCM;

(ii) GCD.

(5 marks)

(c) Given the matrix $A = \begin{pmatrix} 1 & 1 \\ x & y \end{pmatrix}$ and that $A^2 = I$ where I is the 2×2 unit matrix.

Determine the values of x and y .

(5 marks)

5. (a) (i) Evaluate:

$$2 \log_{10} 5 - 3 \log_{10} 2 + \log_{10} 32$$

(ii) Solve the equation

$$4^{(4x)} \times 2^{-2x} = 64$$

(9 marks)

- (b) The length of 30 electrical conduits in meters selected from a workshop were recorded in table 2.

Table 2

Length (m)	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Number of conduits	2	7	11	6	4

Determine:

$$\frac{20 + \frac{11}{2} - 9 \times 11}{2}$$

- (i) the mode;
(ii) median.

(8 marks)

- (c) Calculate the compound interest on Ksh. 10,000 for 3 years at 11% per annum.

(3 marks)

6. (a) The sum of first 8 terms of an arithmetic progression is 236 and the sum of the first 6 terms is 147. Find the sum of the first 12 terms of the series. (7 marks)

- (b) Given the matrices

$$A = \begin{bmatrix} -3 & 0 \\ 7 & -4 \end{bmatrix} \quad B = \begin{bmatrix} 2 & -1 \\ -7 & 4 \end{bmatrix} \text{ and } C = \begin{bmatrix} 1 & 0 \\ -2 & -4 \end{bmatrix}$$

Determine:

(i) $M = 2A - 3B + 4C$;

(ii) M^{-1} .

(9 marks)

- (c) Solve the equation $\log_{10}(7x+3) - \log_{10}(2-x) = 1$.

(4 marks)

7. (a) Given the data 12, 72, 42, 60, 85, 31, 22, 85, 15, 17, 14, 12, 10, 11, 28. Determine the:

- (i) first quartile;
(ii) third quartile;
(iii) interquartile range.

(7 marks)

- (b) The average rate of depreciation in value of a pump is 6% per annum. After four years its value is Ksh. 150,700. Determine its value at the start of the four year period.

(4 marks)

- (c) Given that

$M = \begin{bmatrix} x-4 & 8 \\ 4 & x \end{bmatrix}$ is a singular matrix, determine the:

- (i) possible values of x ;
- (ii) corresponding matrices.

(9 marks)

8. (a) The ^{5th} fifth and ^{11th} eleventh terms of an arithmetic progression are 27 and 45 respectively. Determine the:

- (i) 30th term;
- (ii) sum of the first 16 terms.

(10 marks)

- (b) The first term of a geometric progression is 25 and the sixth term is 30. Determine the tenth term of the progression. (10 marks)

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