

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:

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

(5 marks)

- (ii) Convert  $0.\overline{33}$  to a fraction.

(4 marks)

- (b) The <sup>3</sup>third, <sup>A</sup>fourth and <sup>S</sup>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

$\mu = \frac{\sum x^2}{\sum f} = \frac{\sum (x \cdot x^2)}{\sum f} = \frac{\sum (x \cdot x^2)}{\sum f}$  G.P.

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  $2 \times 2$  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:

$$\frac{20 + \frac{11 - 9 \times 11}{2}}{6}$$

- (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

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

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 fifth and eleventh terms of an arithmetic progression are 27 and 45 respectively. Determine the:

- (i) 30<sup>th</sup> 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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