

1601/103
1602/103
MATHEMATICS I
Oct./Nov. 2022
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/Non-programmable scientific calculator.

This paper consists of EIGHT questions.

Answer any FIVE questions in the answer booklet provided.

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

Candidates should answer the questions in English.

This paper consists of 4 printed pages.

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

Handwritten calculations:
 $\frac{40}{18}$
 $\frac{58}{18}$
 $\frac{72}{18}$

- ✓1. (a) Given the numbers 12, 24, 42 and 60, determine their:
 (i) LCM
 (ii) GCD. (8 marks)
- (b) Evaluate

$$\frac{18 \div 3 \times 8(2 + 14 - 7)}{3 \times 12 \div 4}$$
 (7 marks)
- (c) Three light signals A, B and C go on at intervals of 45 seconds, 75 seconds and 30 seconds respectively. They go on simultaneously at a certain instance. Determine the time that will elapse before the signals go on simultaneously again. (5 marks)

- ✓2. (a) Evaluate:

$$\frac{2\frac{1}{2} \times \frac{1}{3} \div \frac{5}{12} + 1\frac{1}{2}}{\left(\frac{15}{7} - \frac{3}{14}\right) \div \frac{9}{7} \times 2\frac{2}{3}}$$
 (7 marks)
- (b) Evaluate $\frac{12.01 - 10.98 \times 4.23 + 60.4}{20.8 \div 5.2 \times 3.35}$ giving the answer correct to three decimal places. (8 marks)
- (c) Convert the numbers:
 (i) $\frac{5}{32}$ to decimal form
 (ii) $0.\dot{7}$ to a fraction. (5 marks)

3. (a) Solve the equations:
 (i) $9 \times 3^{2x-1} = \frac{3^{x+1}}{27}$
 (ii) $8 \times 5^{x+2} = 7^{2x-3}$ giving the answer correct to two decimal places. (10 marks)
- (b) Solve the equations:
 (i) $\log_2(x-1) - \log_2(x-2) = 1$
 (ii) $\log_x 81 + \log_3 x = 5$ (10 marks)

- ✓4. Given the matrices $A = \begin{pmatrix} 8 & 1 \\ -2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 1 & -4 \\ 2 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} 5 & 1 \\ -6 & 1 \end{pmatrix}$, determine:
 (i) $2A + B - C$
 (ii) BC
 (iii) ABC . (9 marks)

Handwritten marks: 15, 17, 17

Handwritten mark: 15

(b) Given that the determinant of the matrix $M = \begin{pmatrix} x+1 & 1 \\ x & 4 \end{pmatrix}$ is 13, determine the value of x . (4 marks)

(c) Two currents I_1 and I_2 in amperes flowing in an electric circuit satisfy the simultaneous equations:

$$2I_1 + 3I_2 = 9$$

$$4I_1 - I_2 = 11$$

Use the inverse matrix method to solve the equations. (7 marks)

5. (a) The fourth and the fifth terms of an arithmetic progression are 21 and 27 respectively. Determine the:

- (i) first term and common difference;
- (ii) eleventh term;
- (ii) sum of the first thirteen terms. (10 marks)

(b) Given that the first and the last term of a geometric progression are 3 and 96 respectively; and the sum of all the terms is 189, determine the:

- (i) common ratio;
- (ii) number of terms;
- (iii) third term. (10 marks)

6. (a) Table 1 shows the salaries in thousands of shillings of 70 technicians sampled from different companies.

Table 1

Salary	20-25	25-30	30-35	35-40	40-45	45-50	50-55
Number of technicians	3	10	11	22	11	8	5

Determine the:

- (i) mean; $\frac{\sum fx}{\sum f}$
- (ii) median; $L_c + \left(\frac{f_x - cf}{f} \right) \frac{h}{2}$
- (iii) mode;
- (iv) standard deviation. $\sqrt{\frac{\sum fd^2}{\sum f}}$ (16 marks)

(b) Given that the mean of the numbers 18, 20, 15, x , 24, 12 is 17 determine the value of x . (4 marks)

7. (a) Tap A fills a tank in 20 minutes while tap B fills the same tank in 30 minutes. An outlet

tap C empties the tank in 15 minutes. If the tank is initially empty and the three taps are operated simultaneously, determine the time it will take to fill the tank. (8 marks)

(b) A man deposited Ksh 10,000,000 in a bank that pays compound interest at a rate of 8% per annum. If he withdrew the money after five years, determine the interest earned. (5 marks)

(c) The cost of ten resistors and eight capacitors is Ksh 1750 while the cost of twelve resistors and six capacitors is Ksh 1650. Use the inverse matrix method to determine the cost of each item. (7 marks)

✓ 8. (a) Table 2 shows the radii of 100 bolts in a box.

Table 2

Radii (mm)	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Number of bolts	10	23	30	15	10	7	5

Determine the:

- (i) inter-quartile range;
(ii) fourth decile;
(iii) seventieth percentile.

Q1 Q3

(14 marks)

(b) Convert the numbers:

- (i) 148_{10} to binary form;
(ii) 11001011_2 to denary form.

(6 marks)

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