

1521/103 1601/103
1522/103 1602/103
MATHEMATICS I
Oct./Nov. 2017
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 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.

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Turn over

1. (a) Evaluate the expression:

$$\frac{2}{3} \left(\frac{1 \div \frac{1}{5} \text{ of } \frac{3}{4}}{\frac{4}{5} + \frac{1}{3} - \frac{1}{4}} \right)$$

(4 marks)

(b) Given the numbers 18, 36 and 48, find the:

- (i) L.C.M;
- (ii) G.C.D.

(5 marks)

(c) Three bells ring at regular intervals of 15, 30 and 45 minutes. On a certain day, they rang simultaneously at 0700 hours. Determine the next time that they all rang together.

(6 marks)

(d) Convert the recurring decimal $1.\dot{7}$ to an improper fraction.

(5 marks)

2. (a) Evaluate:

Answers

$$(i) \frac{\log 16 - \log 64 + \frac{1}{2} \log 128}{2 \log 4}$$

(4 marks)

$$(ii) \frac{9^{\frac{3}{2}} \times 27^{\frac{1}{3}}}{3^2 \times 243^{-\frac{2}{5}}}$$

(4 marks)

(b) Solve the equations:

$$(i) 4^{2x-1} = 2^{x+1}$$

$$(ii) \log_3(x+2) + \log_3 9 = 3$$

(6 marks)

(c) Convert:

(i) 11001101.101_2 to denary;

(ii) 36_{10} to binary.

(6 marks)

3. (a) If $A = \begin{pmatrix} 1 & 1 \\ 2 & 3 \end{pmatrix}$, $B = \begin{pmatrix} 4 & 3 \\ 5 & 2 \end{pmatrix}$ and $C = \begin{pmatrix} -6 & 2 \\ 4 & 1 \end{pmatrix}$

Find:

- (i) $A + B + C$;
- (ii) $\det B$;
- (iii) C^{-1} ;
- (iv) ABC .

(11 marks)

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- (b) Two currents I_1 and I_2 in amperes flowing in a simple electrical circuit satisfy the equations:

$$2I_1 + 3I_2 = 13$$

$$5I_1 - 2I_2 = 4$$

Use the inverse matrix method to solve the equations.

(9 marks)

4. (a) The 6th and 10th terms of an arithmetic progression are 18 and 30 respectively. Determine the:

- (i) common difference;
(ii) first term;
(iii) sum of the first 18 terms.

(8 marks)

- (b) The sum of the 4th and 6th terms of a geometric progression is 80. If the product of the 3rd and 5th terms is 256, determine the:

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

(12 marks)

5. (a) Given the data:

25, 30, 42, 30, 54, 62

Find the;

- (i) mode;
(ii) median.

(4 marks)

- (b) Table 1 shows the frequency distribution of scores obtained by 40 students in a practical test.

Table 1

Scores (%)	55-60	60-65	65-70	70-75	75-80	80-85	85-90
Number of students	2	4	9	15	6	3	1

Determine the:

- (i) mean using an assumed mean of 72.5;
(ii) median marks;
(iii) standard deviation of the distribution.

(16 marks)

6. (a) Simplify, giving the answer with positive integers.

$$\frac{(8x^4y^{\frac{3}{2}})6(z^{\frac{2}{5}})}{16x^6y^{\frac{1}{4}}z^{-\frac{1}{5}}}$$

(3 marks)

- (b) (i) Without using tables or calculator. Evaluate:

$$(2\text{Log}_4 256) \times (\text{Log}_6 261)$$

- (ii) Solve the equation:

$$9^{2x+3} = 27^{x+1}$$

(7 marks)

- (c) Solve the equation:

(i) $\text{Log}_3(x+2) + \text{Log}_3 9 = 4$

(ii) $\text{Log}_x 27 = \text{Log}_2 8$

(7 marks)

- (d) A geometric progression is such that the second term is 16 and the fourth term is 256. Determine the common ratio.

(3 marks)

7. (a) Given that $12\frac{1}{2}$, x , y , z , $20\frac{1}{2}$ sequence form an arithmetic progression, determine the values of x , y , and z .

(5 marks)

- (b) Given the matrix:

$$A = \begin{pmatrix} 1 & 1 \\ -2 & 4 \end{pmatrix}, \text{ show that } A^2 - 5A + 6I = 0$$

(5 marks)

(c) Figure 1 shows a d.c electric network.

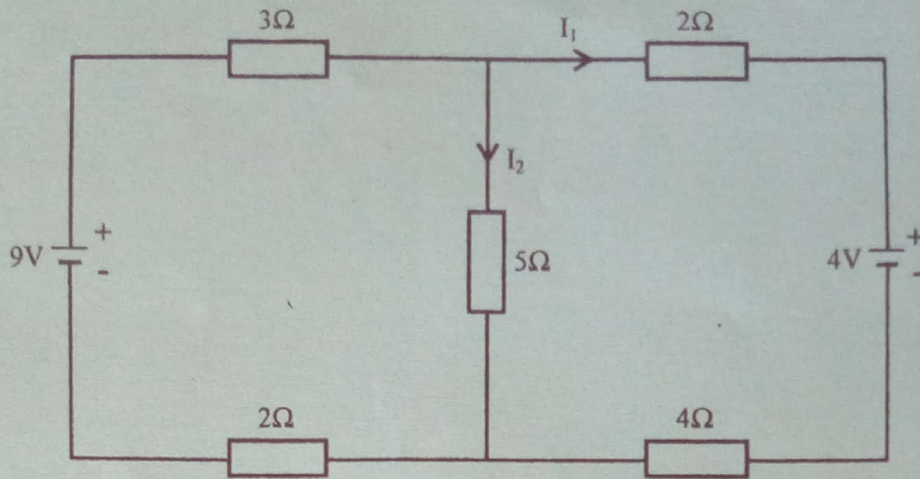


Fig. 1

Use cramer's rule to determine the currents I_1 and I_2 .

(10 marks)

8. Table 2 shows the frequency distribution of the floor area of houses in an estate in square metres.

Table 2

Floor area (m^2)	Frequency (f)
2 - 4	2
4 - 6	3
6 - 8	7
8 - 10	13
10 - 12	16
12 - 14	12
14 - 16	8
16 - 18	6
18 - 20	3

Determine the:

- (i) mean;
- (ii) mode;
- (iii) semi interquartile range;
- (iv) standard deviation of the distribution.

(20 marks)

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