Scanned

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.

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:

   (i) $\dfrac{Log\,16 - Log\,64 + \frac{1}{2}\,Log\,128}{2\,Log\,4}$ (4 marks)

   [handwritten working:] $\dfrac{Log\,2^4 - Log\,2^6 + \frac{1}{2}\,Log\,2^7}{2\,Log\,2}$
   $\dfrac{4\,log\,2 - 6\,log\,2 + 3.5\,log\,2}{2\,log\,2} = \dfrac{1.5\,log\,2}{2\,log\,2}$
   $1.5 \div a = 0.375$ *(underlined)*

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

(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; 30
(ii) median. 25, 30, 30, 42, 54 62 (4 marks)
30 + 42 = 36

(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 intergers.

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

(3 marks)

(b) (i) Without using tabies or calculator. Evaluate:

$$(2Log_4 256) \times (Log_6 261)$$

(ii) Solve the equation:

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

(7 marks)

(c) Solve the equation:

(i) $Log_3(x+2) + Log_3 9 = 4$

(ii) $Log_x 27 = Log_2 8$

(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:

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

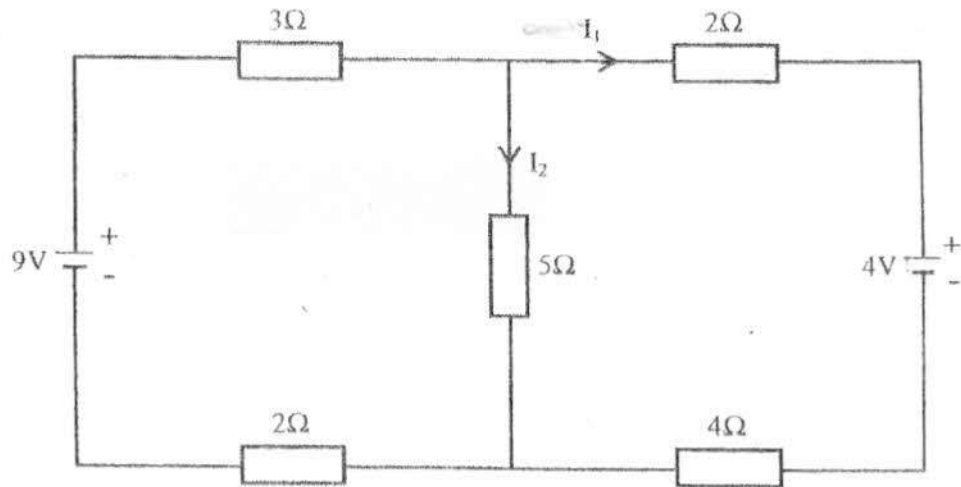(5 marks)

(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 (m²)	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)

THIS IS THE LAST PRINTED PAGE.