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.

1. (a) Evaluate the expression:

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

(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)

(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;
   (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 intergers.

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

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

$$(2Log_{4}256)\text{ x }(Log_{6}261)$$

(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:

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

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

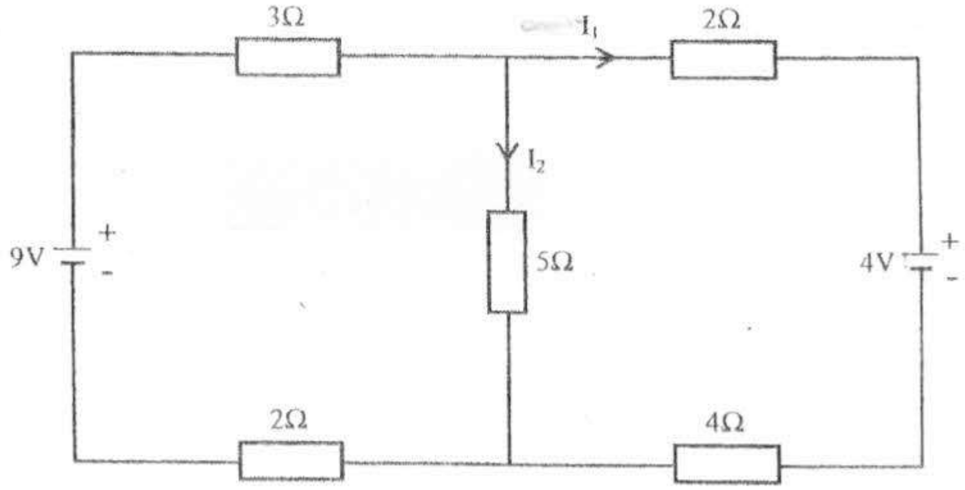

Fig. 1

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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