1601/103
1602/103
MATHEMATICS I
June/July 2021
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:
Non-programmable scientific calculator/Mathematical tables;
Answer booklet;
*This paper consists of **EIGHT** questions.*
*Answer any **FIVE** questions in the answer booklet provided.*
All questions carry equal marks
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) Determine the inverse of the matrix

$$A = \begin{bmatrix} 2 & 5 \\ 4 & -3 \end{bmatrix}$$

(4 marks)

(b) Use the result in (a) to solve the simultaneous equations:

$$2x + 5y = 12$$
$$4x - 3y = -2$$

(7 marks)

(c) Given that $C = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $D = \begin{bmatrix} 5 & 6 \\ 7 & 8 \end{bmatrix}$

Determine:

(i) $(CD)^T$

(ii) $2C + 3D$

(iii) $|D - C|$

(9 marks)

2. (a) Determine the values of x:

(i) $\log_7(3x+1) - \log_7(2x-7) = 3$;

(ii) $\left(\frac{1}{8}\right)^x = 128$

(10 marks)

(b) Evaluate

$$\frac{\log_{10}9 - \log_{10}3 + \frac{1}{3}\log_{10}81}{\log_{10}9};$$

(5 marks)

(c) Solve the equation correct to 2 decimal places.

$4^{2x-1} = 5^{x+2}$

(5 marks)

3. (a) Determine the term whose value is 22 in the series

$2\frac{1}{2}, 4, 5\frac{1}{2}, \ldots$

(5 marks)

(b) The first, twelfth and last term of an arithmetic progression are $4, 31\frac{1}{2}$ and $376\frac{1}{2}$ respectively.

Determine:

(i) the number of terms.

(ii) the sum of all the terms.

(iii) the 80th term.

(10 marks)

(c) A technician started on a salary of Ksh 120,000 per annum and received a constant annual increment. If he earned a total of Ksh 648,000 by the end of 5 years, determine his annual increment. (5 marks)

4. (a) Determine the values of x for which the matrix has no inverse.

$$M = \begin{bmatrix} (x-2) & 4 \\ 4 & (x-2) \end{bmatrix}$$

(5 marks)

(b) Convert:
(i) 35_{10} to base 2
(ii) 10101_2 to base 10. (5 marks)

(c) Solve for the currents I_1 and I_2 in figure 1 using inverse matrix method. (10 marks)

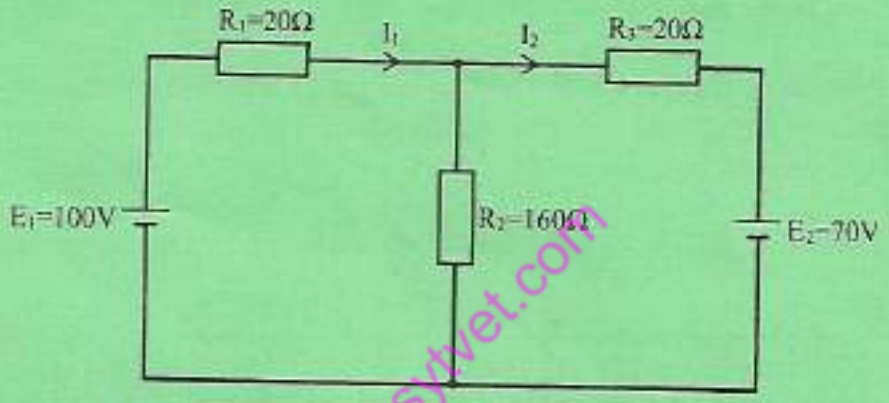

Fig. 1

5. (a) Given the following numbers;
18, 24 and 48:
Determine the:
(i) LCM;
(ii) GCD. (7 marks)

(b) Draw a pie chart for the data given in Table 1.

Table 1

Item	Amount (Ksh)
Salary	10,000
Expenditure	5,000
Savings	2,000

(4 marks)

(c) Three students shared some money. Student A got $\frac{1}{12}$, student B got $\frac{1}{9}$ and student C got the remainder. If the student C got Ksh 290, determine the:

(i) fraction student C got
(ii) total sum of the money shared;
(iii) amount received by Student A
(iv) amount received by student B.

(9 marks)

6. (a) The ratio of the fourth and the first terms of a geometric progression is 64. Given that the third term is 48, determine

(i) common ratio;
(ii) the first term. (6 marks)

(b) Given $4 + 20 + 100 + ... + 1562500$.
Evaluate:

(i) common ratio;
(ii) the number of terms in the series;
(iii) sum of the series.

(9 marks)

(c) Find the rate per annum at which a certain amount of money doubles after being invested for a period of 5 years compounded annually. (Give answer correct to 1 decimal place). (5 marks)

7. (a) **Table 2** shows the distribution of marks of 40 candidates in a mathematics test.

Table 2:

Marks	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Frequency	2	2	3	9	12	5	2	3	1	1

Determine:

(i) Mean;
(ii) Standard deviation.

Correct to 2 decimal places. (11 marks)

(b) From the data in Table 3, determine:

(i) Mode;
(ii) Median

Correct to 2 decimal places.

Table 3:

Class interval	0-5	5-10	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	3	7	9	19	14	12	5	4	3

(9 marks)

8. (a) Solve for x in the equations:

(i) $3^{4x} = 27^{(x+3)}$

(ii) $4^x \times 3^{2x} = 6$ (8 marks)

(b) Simplify

(i) $\sqrt{\left(\frac{a^4y^3}{b} \div \frac{b^{-3}}{a^2y^0}\right)}$

(ii) $\frac{1}{(\sqrt{3}-\sqrt{2})} + \frac{1}{(\sqrt{3}+\sqrt{2})}$ (6 marks)

(c) A sum of money accumulates to Ksh 3,200 in 5 years at 5% per annum simple interest. If the rate is 8%, determine the time it would take for the amount to be Ksh 4,096.40 simple interest. (6 marks)

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