

1503/103  
MATHEMATICS I  
June/July 2023  
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL  
CRAFT CERTIFICATE IN AUTOMOTIVE ENGINEERING

MODULE I

MATHEMATICS I

3 hours

**INSTRUCTIONS TO CANDIDATES**

You should have the following for this examinations:

*Answer booklet;*

*Mathematical tables/Non-programmable scientific calculator.*

*This paper consists of TWO sections; A and B.*

*Answer ALL questions in section A and any THREE questions from section B.*

*Maximum marks for each part of a question are 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.**

**SECTION A: 40 marks**

Answer ALL questions in this section.

1. The 8th and 12th terms of an arithmetic progression are 47 and 71 respectively. Determine the:
- (a) first term;
- (b) common difference;
- of the progression.

(4 marks)

2. Solve the equation:  $\log_4(4x+3) - \log_4(2x-5) = 2$ .

(4 marks)

3. Change the recurring decimal number  $6.\overline{57}$  into a fraction.

(4 marks)

4. Given the matrices  $A = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$  and  $B = \begin{bmatrix} 5 & 4 \\ -3 & 2 \end{bmatrix}$ ; determine:

(a)  $A + B^T$ ;

(b)  $AB$ .

(4 marks)

5. Given the numbers 48, 64 and 54, determine the G.C.D.

(4 marks)

6. Table 1 represents the lengths of bolts produced by C.N.C machine.

Table 1

Length of bolts in mm	0 - 4	5 - 9	10 - 14	15 - 19	20 - 24	25 - 29
No. of bolts	2	3	4	2	3	2

Determine the mean.

(4 marks)

7. Change the:

(a) Denary number  $221_{10}$  to binary form;

(b) Binary number  $1111011_2$  to decimal form.

(4 marks)

8. A technical spent  $\frac{1}{4}$  of his salary on school fees and  $\frac{1}{4}$  of the remainder on electricity and water bills. He then spent  $\frac{1}{9}$  of what was left on transport. If he had Ksh 16,000 left, determine his salary.

(4 marks)

9. Ksh 100,000 was invested in a bank at an interest of 10% for 3 years. Determine the:
- (a) Simple interest;  
 (b) Compound interest. (4 marks)
10. A technical college has 20 students, 30 students and 50 students pursuing certificate in welding, automotive and production respectively. Represent this information in a pie-chart. (4 marks)

**SECTION B: 60 marks**

Answer any **THREE** questions from this section.



- (a) Given the matrix  $A = \begin{bmatrix} 1 & 2 \\ 4 & 3 \end{bmatrix}$ ; determine:
- (i) matrix  $B^T$  such that  $A^2 = A + B$ ;  
 (ii)  $B^{-1}$ . (8 marks)

- (b) If matrix  $C = \begin{bmatrix} 2x & 4-x \\ 2 & 1 \end{bmatrix}$  is a singular matrix, determine the value of  $x$ . (4 marks)

- (c) Use a matrix method to solve the equations:
- $$\begin{matrix} 2x + 3y = 28 \\ 3x - 4y = -9 \end{matrix}$$
- 13y + 102*
- (8 marks)

12. (a) Table 2 shows the marks scored by 20 students taking a certificate course in automotive engineering.

Table 2

Marks	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30
No. of Students	2	3	4	$x$	$y$	2

Given the modal mark is 17; determine the:

- (i) values of  $x$  and  $y$ ;  
 (ii) 5<sup>th</sup> decile.  $y = 3$   
 $x = 6$
- (10 marks)

(b) Table 3 represents the weights of students in kg.

Table 3

weight	35-40	40-45	45-50	50-55	55-60	60-65
no. of students	4	5	6	3	2	2

Using an assumed mean of 47.5, determine

- (i) mean weight;
- (ii) variance;
- (iii) standard deviation.

13.

(a) Solve the equations:

$$\begin{aligned}5 \log_2 x + 7 \log_3 y &= 19 \\4 \log_2 x - 6 \log_3 y &= -8\end{aligned}$$

(10 marks)

(10 marks)

(b) Simplify, without using a calculator:

$$\frac{\frac{2}{5} \times \frac{3}{4} + \frac{7}{2} \text{ of } \frac{1}{8}}{\frac{3}{5} \div \left( \frac{3}{2} - \frac{2}{3} \right) + \frac{1}{2}}$$

(10 marks)

14.

(a) The sum of the first three terms of an arithmetic progression is 24. If the sum of their squares is 200, determine the terms.

(10 marks)

(b) The current price of a car is Ksh 800,000. If it depreciates at 10% per annum, determine the price of the car after 5 years.

(4 marks)

(c) Three alarm clocks ring at intervals of 30 minutes, 35 minutes and 40 minutes respectively. If they rang together at 4.10 am on Monday, determine the next time they will ring together.

(6 marks)

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