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 examination;
Answer booklet;
Mathematical tables;
Scientific calculator.
This paper consists of TWO sections; A and B.
Answer ALL questions in section A and any THREE question from section B.
Maximum marks for each part of a question are as indicated.
Candidates should answer all 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.

Turn over

SECTION A (40 marks)

Answer ALL questions in this section.

1. Solve the equation:

   $Log_2[14x+4] - Log_2[5x+7] = 3$

   (4 marks)

2. Evaluate $\left(3\frac{3}{4} \times 1\frac{1}{5}\right) - 2\frac{5}{9}$.

   (4 marks)

3. Calculate the compound interest on Ksh 20,000 for 3 years at 10% per annum.

   (4 marks)

4. Given that $A = \begin{bmatrix} 6 & 2 \\ 3 & 8 \end{bmatrix}$ and $B = \begin{bmatrix} -7 & 2 \\ 6 & 3 \end{bmatrix}$.

   Find (i) AB

        (ii) A + B

   (4 marks)

5. Table 1 shows the distribution of the diameter of bolts produced by a lathe machine.

   Table 1

Diameter	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
No. of bolts	2	7	11	6	4

   Determine the mode of the distribution.

   (4 marks)

6. Determine the sum of the first 20 terms of the series

   $2 + 4 + 6 + 8 \ldots$

   (4 marks)

7. Express the recurring decimal $0.6\dot{7}$ as a fraction.

   (4 marks)

8. Convert (i) 23_{10} to binary.

   (2 marks)

        (ii) 101011_2 to decimal.

   (2 marks)

9. Determine the L.C.M of the numbers 28, 35 and 42.
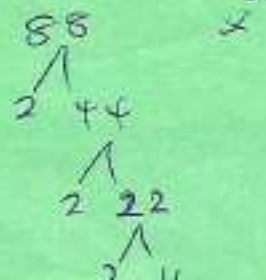
   (4 marks)

10. Solve the equation $4^x = 88^{(x-5)}$

    (4 marks)

11. (a) Simplify the expression

$$\frac{\log_5 125 - \frac{1}{2}\log_5 25}{3\log_5 5 + \log_5 625}$$

(5 marks)

(b) Table 2 shows the number of vehicles arriving for service in a petrol station in 40 weeks.

Table 2

No. of weeks	0 - 5	5 - 10	10 - 15	15 - 20	20 - 25	25 - 30	30 - 35	35 - 40
No. of cars	3	4	5	6	7	5	4	5

Calculate the:

(i) mean
(ii) median
(iii) standard deviation.

(15 marks)

12. (a) Given the matrices $A = \begin{bmatrix} 3 & 2 \\ 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 3 \end{bmatrix}$.

Determine (i) $A + B$

(ii) $(AB)^{-1}$

(6 marks)

(b) Two forces F_1 and F_2 in newtons acting on a mechanical system satisfy the equations:

$$F_1 + 3F_2 = 7$$
$$2F_1 + 5F_2 = 12$$

Use the inverse matrix method to solve the equations. (8 marks)

(c) Solve:

$$\frac{2}{3} \div \frac{1}{5} + \left[1\frac{1}{4} + \frac{3}{4} \right] - \frac{2}{5}$$

(6 marks)

Turn over

(a) Mechanics A, B and C were paid Ksh. 5600 for a panel beating job. A and B received $\frac{5}{18}$ and $\frac{7}{18}$ respectively, of the total amount. The balance was paid to C.

Calculate the

(i) fraction of C's share;

(ii) amount each of them received. (5 marks)

(b) The fifth, and the eleventh terms of an arithmetical progression are 19 and 43 respectively. Determine the

(i) 20th term. (6 marks)

(ii) sum of the first 16 terms. (3 marks)

(c) The first term of a geometric progression is 19 while the sixth term is 27. Determine the tenth term of the progression. (6 marks)

14. (a) Table 3, shows the marks obtained by 30 automotive engineering students in a mathematics test:

Table 3

77	96	85	84	68
53	75	75	74	76
82	97	63	68	77
72	90	94	95	81
57	73	88	59	67
76	95	86	93	62

(i) Arrange this data in a frequency table taking the classes as 50 - 59, 60 - 69 ...

(ii) hence calculate the mean mark.

(8 marks)

(b) Table 4 gives the lengths of 21 screws produced by a machine in a factory.

Table 4

Length (cm)	0 - 9	10 - 19	20 - 29	30 - 39	40 - 49	50 - 59	60 - 69
No. of screws	2	3	5	4	3	2	2

Use the data in table 4 to calculate the:

(i) 4th decile;

(ii) 60th percentile;

(iii) upper quartile.

(12 marks)

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