THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONICS TECHNOLOGY

(POWER OPTION)
(TELECOMMUNICATION OPTION)

MODULE I

MATHEMATICS I

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:

Answer booklet;
Electronic calculator/Mathematical tables;
Geometrical set.

*This paper consists of **EIGHT** questions. Answer any **FIVE** questions.*

This paper consists of 6 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

(c) (i) A solid copper cuboid measures 25cm long by 5cm wide by 2cm thick. It is drawn into a wire of cross-sectional area of 2.5 mm². How long is the wire.

(ii) If the copper density is 8.5 g/cm³, find the weight of 20 meters of the wire.

(7 marks)

6. (a) Evaluate without the use of mathematical table for x

$2 \log (x - 5) = 4 \log 2$

(5 marks)

(b) The sum of the first six terms of an arithmetic progression is 97.5 and the sum of the first twelve terms of the same progression is 213. Find the first term and the common difference of the progression.

(7 marks)

(c) Given

$$A = \begin{pmatrix} 3 & 4 \\ 2 & 1 \end{pmatrix} \qquad B \begin{pmatrix} 2 & 3 \\ -1 & 1 \end{pmatrix}$$

Find

(i) A^{-1}

(ii) B^{-1}

(iii) C if $C = A^{-1}B^{-1}$

(8 marks)

7. In figure 1 drawn below, PQ = QR = RS = ST = IM
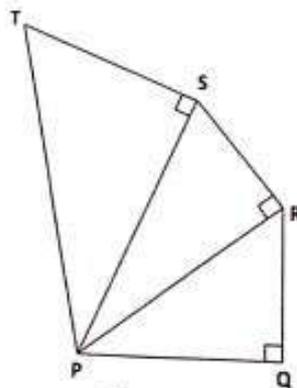$\angle PQR = \angle PRS = \angle PST = 90°$

Figure 1

Determine the length of
(i) PR
(ii) PT

(5 marks)

1. Given that $p = 25$ and $q = \frac{1}{8}$.

    (a)   Calculate $\frac{1}{4}q^{-\frac{2}{3}}$.

    (b)   Give all the possible values of $(2pq)^{\frac{1}{2}}$ (6 marks)

    (c)   Use mathematical tables to evaluate the following correct to 3 significant figures.

$$\frac{43.25 \times 0.9371}{(2.641)^{\frac{1}{2}} \div 8.43}$$
    (5 marks)

    (d)   (i) $A = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ find the inverse of the matrix A.

            (ii)   Use matrix method to solve for m and n.

$$6m + 7n = 5$$
$$5m + 3n = 7$$
    (9 marks)

2.   (a)   A car costs sh.750,000 when it was bought at the beginning of January 1985. After purchase the value of the car depreciated by 15% in the year and by 8% per year after that. Calculate the value of the car at the end of December 1988.   (4 marks)

    (b)   (i)   Find the value of 4th term in the expansion of $(x + 2y)^6$.   (4 marks)

            (ii)   Use binomial expansion to calculate the value of $(0.98)^5$ to four significant figures.   (4 marks)

    (c)   In an electrical examination the following scores were recorded

$$10, 12, 13, 4, 6, 7, 12, 9, 13, 18, 17, 16, 8, 7, 6.$$

If fifteen students took the exam and 12 was the pass mark determine the:

    (i)   mode
    (ii)   median mark
    (iii)   percentage of students who failed
    (iv)   mean

            (8 marks)

3.   (a)   Solve

$$\frac{1}{6}(5x + 3) - \frac{1}{3}(2x - 7) = \frac{3}{8}$$

            (4 marks)

(b)   Simplify

$$\frac{512^{x} \times 27^{x}}{128^{2} \times 9^{-2}}$$

(4 marks)

(c)   A bus leaves Nairobi at 2337 hrs and travels for 45 minutes to its next stop at Mai Mahiu a distance of 56 km.
Calculate:

(i)   the time at which the bus arrives at Mai Mahiu.

(ii)   its average speed in km/h.

(4 marks)

(d)   A solid metallic cube measures 6cm by 6cm by 6cm. It is melted down and during this process 5% of the metal is lost. The remaining amount is recast into two equal solid cylinders. Calculate the volume of 1 cylinder. If the base radius of the cylinders is 3cm determine their heights (use $\pi = \frac{22}{7}$).

(8 marks)

4.   (a)

Mark	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
No. of students	30	45	89	120	140	185	81	65	35	10

Eight hundred students sat for a national exam. From the above data determine the:

(i)   mean mark;

(ii)   standard deviation.

(10 marks)

(b)   Express the recurring decimal as fraction

$0.1\dot{4}\dot{5}$

(5 marks)

(c)   Solve

$$2^{x-3} \times 8^{x^{2}+3} = 128$$

(5 marks)

5.   (a)   Two neigbouring schools ring bells at the intervals of 30 and 35 minutes. The bells ring together at 7:30 a.m. Find the time of the day when the bells will ring at the same time again before 4.30 p.m.

(6 marks)

(b)   The first term of a geometrical progression is 2 and the fifth term is 512. Calculate the:

(i)   common ratio;
(ii)   sum of the first five terms.

(7 marks)

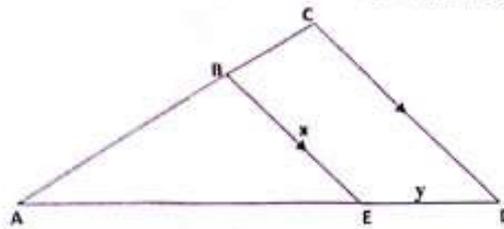(b)   BE//CD, AB = 7.5, BC = 2.5 cm, AE = 9cm and CD = 8 cm. Find x and y.

(7 marks)

Figure 2

(c)
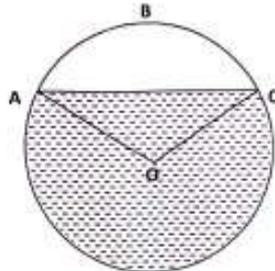

Figure 3

Figure 3, shows a cross-section of a closed cylindrical container with a base radius of 10cm and a length of 25 cm. O is the centre of the cross - sections and $\angle AOC = 120°$

Calculate the :

(i)   area of sector ABCO

(ii)   area of triangle AOC

(iii)   volume of water in the cylinder.

(8 marks)

8.   (a)   A sum of Ksh.6,000 is invested at 8% per annum compound interest. After how long will this sum amount to Ksh.8,250.
Give your answer to the nearest month.

(6 marks)

(b)   In a triangle ABC, AB = 6cm, AC = 8cm and $\angle BAC = 50°$. Calculate the:

(i)   length of BC.

(ii) $\angle ABC$

(8 marks)

(c)   A straight line passes through the points (0,6) and (2,2). Find the:

    (i)   gradient of the line.

                                                  (4 marks)

    (ii)   equation of the line.

                                                  (2 marks)

(d)   Solve for x, $\dfrac{8}{2^x} = 64^x$