11205/01 016

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CARPENTRY AND JOINERY CRAFT CERTIFICATE
MASONRY CRAFT CERTIFICATE
PLUMBING CRAFT CERTIFICATE
ROAD CONSTRUCTION CRAFT CERTIFICATE

MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
  Drawing instruments;
  Mathematical tables/ Scientific calculator;
  Answer booklet.
*This paper consists of **EIGHT** questions.*
*Answer any **FIVE** questions.*
All questions carry equal marks.
Maximum marks for each part of a question are as shown.
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) Solve the equation $5.3^{3x-2} = 3.5^{x+1}$, giving the answer correct to four significant figures. (6 marks)

    (b) Solve for x

        (i) $3^{2x+1} = 9^{5x-3}$

        (ii) $\log 2x^3 - \log x = \log 16 - \log x$. (7 marks)

    (c) Use factorization method to solve $3x^2 - 13x - 10 = 0$. (4 marks)

    (d) Solve the simultaneous equations

        $x - 8y = -19$
        $9x - y = 42$

        (3 marks)

2. (a) A reservoir in the form of a square - based pyramid has a height of 60 m and length of 25 m. Calculate its volume. (4 marks)

    (b) Find the volume of a cone of radius 72 cm and perpendicular height of 96 cm. (4 marks)

    (c) A spherical container has a diameter of 270 mm. Find its surface area in cm². (4 marks)

    (d) A storeyed building is built on a level ground. At a point 150 m from the foot of the building the angle of elevation of the top of the building is 38°. Determine the height of the building. (4 marks)

    (e) Evaluate: $5 \cos 30° + 10 \cos 60°$ without using a calculator or tables, leaving the answer in surd form. (4 marks)

3. (a) **Table 1** shows the masses of pieces of timber, to the nearest gram.

        Table 1

95	100	113	117	86	91	92	115
104	101	98	94	102	112	97	118
100	106	119	102	107	96	101	102
105	93	99	107	98	105	114	100
104	108	92	109	95	100	103	110
113	99	106	110	101	105	85	88
106	90						

(i) Construct a frequency distribution table taking the class intervals as 85 - 90, 90 - 95, ...

(ii) Draw a histogram to illustrate the data and hence estimate the mode.

(9 marks)

(b) Table 2 gives the cumulative distribution of the lengths of metal bars (in cm) of 400 pieces at a construction site:

Table 2

Length	0 - 100	100 - 110	110 - 120	120 - 130	130 - 140	140 - 150	150 - 160	160 - 170
Cumulative frequency	0	27	85	215	320	370	395	400

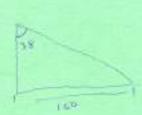(i) Draw a less than cumulative frequency curve;

(ii) Hence estimate the median length.

(6 marks)

(c) Table 3 shows the frequency distribution of the amount of profit made by 100 companies.

Table 3

Profit (millions)	No. of companies
10 - 20	3
20 - 30	a
30 - 40	19
40 - 50	20
50 - 60	b
60 - 70	18
70 - 80	1
	100

Given that the median is 56, find the values of 'a' and 'b'. (5 marks)

4. (a) Given the matrices $A = \begin{bmatrix} 5 & 4 \\ 3 & 6 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 3 \\ 0 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 4 & 2 \\ 3 & 1 \end{bmatrix}$. Find:

(i) $(A + B) - C$

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

(8 marks)

(b) The total cost of 30 bags of cement and 5 lorries of sand is Ksh 96000 while for 20 bags of cement and 6 lorries of sand the cost is Ksh 104,000. Use the inverse matrix method to determine the cost of one bag of cement and one lorry of sand.

(12 marks)

5. (a) If $a = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$, $b = \begin{pmatrix} 3 \\ 4 \end{pmatrix}$ and $C = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$, find:

    (i) $\frac{1}{2}(a - c)$

    (ii) $2a - 3b + c$

            (4 marks)

   (b) Resolve the displacement vector of 50 N at an angle of 150° into its horizontal and vertical components. (5 marks)

   (c) The position vectors of A and B relative to O are $\begin{pmatrix} 4 \\ 8 \end{pmatrix}$ and $\begin{pmatrix} 12 \\ -16 \end{pmatrix}$ respectively. Points L and M divide $\overline{OA}$ and $\overline{OB}$ in the ratio 3:1. Determine:

    (i) the position vectors of L and M;
    (ii) $\overline{AB}$;
    (iii) $\overline{LM}$.

            (11 marks)

6. (a) Solve the equation $5\cos 2\theta = 2\sin\theta + 3$ for $0° \leq \theta \leq 720°$. (8 marks)

   (b) Show that $\cot 2\theta = \frac{1 - \tan 2\theta}{2\tan\theta}$. (4 marks)

   (c) A plot is in the shape of a triangle with sides ABC. Given that $\angle A = 50°$, $\angle B = 60°$ and $BC = 15\,m$, determine:

    (i) $\angle C$;
    (ii) length AB;
    (iii) length AC.

   Give the answer correct to a whole number. (8 marks)

7. (a) A crowd is made up of 20 men and 30 women. Determine the probability of selecting at random a

    (i) man;
    (ii) woman.

            (2 marks)

   (b) When testing 100 soldered joints, 5 failed during a vibration test and 8 failed due to having a high resistance. Determine the probability of a joint failing due to

    (i) vibration;
    (ii) high resistance;
    (iii) vibration and high resistance;
    (iv) vibration or high resistance.

            (8 marks)

1301/311   1304/311   4
1305/311   1309/311
June/July 2016

(c)   One bag contains 4 red and 6 black marbles and a second bag contains 3 green and 5 white marbles. One marble is drawn from the first bag and two marbles from the second bag, without replacement. Determine the probability of having:

    (i)   one red and two white marbles;
    (ii)   no green marbles;
    (iii)   either one black and two green or one black and two white marbles.

                                                       (10 marks)

8.   (a)   A local map has a scale of 1:22500. The distance between two towns is 5.4 km. Determine the distance between the two towns on the map.   (4 marks)

    (b)   Some guttering on a house has to decline by 6 mm for every 140 cm to allow rainwater to drain. The gutter spans 16.8 m. Determine how much lower the low end should be.   (5 marks)

    (c)   If y is inversely proportional to x and $y = 12.5$ when $x = 0.8$, determine:

        (i)   the coefficient of proportionality;
        (ii)   the value of y when $x = 2.5$;
        (iii)   the value of x when $y = 32.5$.

                                                       (8 marks)

    (d)   A salesman with hardware goods industry sold 2500 pieces of iron sheets at Ksh 700 per piece and 3000 packets of cement at Ksh 750 per packet. If he gets a 5% commission on the sales, calculate his total commission.   (3 marks)

THIS IS THE LAST PRINTED PAGE.

1301/311   1304/311
1305/311   1309/311
June/July 2016   5