1301/311
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MATHEMATICS
June/July 2011
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

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

MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATES

You should have the following for this examination:
Answer booklet;
Electronic calculator

Answer any **FIVE** *of the* **EIGHT** *questions in this paper*
ALL *questions carry equal marks.*
Maximum marks for each part of a question is as shown.

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

1. (a) Solve the equation
$$3^{2x+1} = 5(3^x) - 1$$
(8 marks)

(b) Given that $\log_3 x + \log_{27} y = 8$
Show that $xy = 6561$. Hence solve for x and y in the simultaneous equations:

(i) $\log_{10}(x+y) = 3$;

(ii) $\log_3 x + 3\log_{27} y = 8$.
(12 marks)

2. (a) Given the matrices

$$A = \begin{pmatrix} 3 & -4 \\ 5 & -3 \end{pmatrix}, \quad B = \begin{pmatrix} 2 & 2 \\ 3 & 1 \end{pmatrix}$$

Find:

(i) $5A - 3B$;

(ii) $(BA)^{-1}$;

(iii) $3A^T + B^T$.
(9 marks)

(b) Given the matrix

$$C = \begin{pmatrix} x-1 & 1 \\ 2 & x-2 \end{pmatrix}$$

and that $\det C = 0$. Solve for x.
(4 marks)

(c) Use the inverse matrix method to solve the simultaneous equation.

$3x + 2y = 8$
$x - 4y = -2$
(7 marks)

3. (a) A solid cylinder has a total surface area of $8.4 m^2$. Determine the volume to three significant figures, given that its height is 50.0cm.
(8 marks)

(b) (i) Plot the graph of $y = 8 + 5x - 3x^2$ for values of x from $x = -3$ to $x = 4$

(ii) Use the graph to find the roots of the equation $6 + x - 3x^2 = 0$
(12 marks)

4. (a) Prove the following identities.

    (i) $\dfrac{\cos\theta\tan\theta}{\sin\theta} - \cos^2\theta = \sin^2\theta$

    (ii) $\dfrac{\tan^2+1}{\tan^2\theta} = \dfrac{1}{1-\cos^2\theta}$

    (7 marks)

    (b) Solve the following trigonometric equations:

    (i) $8\cos^2 x + 3\sin^2 x + 5\sin x + 1 = 0;$ $0^0 \le x \le 360^0$

    (ii) $\sin(2\theta + 20^0) = 0.8$ $0^0 \le \theta \le 360^0$ (13 marks)

5. (a) The third and fifth terms of a Geometric progression are $\dfrac{9}{4}$ and $\dfrac{81}{64}$ respectively.

    Determine:

    (i) the seventh term;

    (ii) the sum of the first fifty terms.   (13 marks)

    (b) There are 20 animals feeding stations in a line with a supply hut. The stations are fifty metres apart and the nearest is five metres from the hut. An attendant carries a bag at a time from the hut to each of the feeding stations. Calculate how far attendant will have walked after supplying all the feeding stations.   (7 marks)

6. (a) Table shows the distribution of diameters to the nearest number of 100 bolts.

Diameter (mm)	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64
No. of bolts	3	8	11	18	26	20	10	4

    Calculate:

    (i)   the median diameter;
    (ii)   the mean diameter.   (12 marks)

6. (b) Bag A contains 5 red balls and 3 green balls, while bag B contains 4 red balls and 5 green balls. Two balls are chosen at random without replacement:

    (i) construct a probability tree diagram for the selection;

    (ii) calculate the probability the two balls chosen are of different colours.

                          (8 marks)

7. (a) P, Q, R and S are points in space such that S(0,0)

$$PQ = \binom{4}{3}, \quad QR = \binom{2}{5} \quad \text{and} \quad SP \binom{6}{9}$$

Find:

    (i) PR;

    (ii) the magnitude and direction of RS.   (9 marks)

  (b) Four forces 10N, 12N, 15N and 5N act at a point in the directions 30^0, 100^0, 240^0 and 300^0 respectively. Determine the manitude and direction of the resultant force using the method of resolution of forces.   (11 marks)

8. (a) A farmer bought a machine at a cost of Ksh. 220,000. If the machine depreciates at 15% per annum, calculate:

    (i) the value of the machine after 3 years;

    (ii) the number of years it will take for the value to depreciate to Ksh. 70,000.

                          (6 marks)

  (b) During a certain period, the exchange rates were as follows:

    1 sterling pound = Ksh. 130.0
    1 sterling pound = US $ 1.8
    1 US $ = Ksh. 80.3

    A factory management intended to import some equipments worth Ksh. 700,000 from U.K. It changed money into Sterling Pounds. Later the management found that the equipments were cheaper in U.S.A. Calculate the amount of money the management ended up with in U.S $.

                          (4 marks)

  (c) At the end of the month an employee finds that Ksh. 3,000 is deducted from his salary as PAYE. If the employee is entitled to a family tax relief of Ksh. 455, calculate his monthly salary.   (10 marks)