1204/311
MATHEMATICS
June / July 2007
Time: 3 hours

THE KENYA NATIONAL EXAMINATIONS COUNCIL

ELECTRONIC CRAFT PART III

MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATES:

You should have the following for this examination:

Answer booklet with graph papers
Mathematical tables/Calculator

*Answer any **FIVE** of the following **EIGHT** questions.*
All questions carry equal marks.
All working must be 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 no questions are missing.

Turn over

1. (a) Solve the following simultaneous equations

(i) $\log_2 (x + y) = 4 - \log_2 x$

(ii) $\log_2 y - \log_2 x = 2$

(8 marks)

(b) Solve the equation for x,

$2e^{2x} + 14e^{x} - 1 = 0$ (6 marks)

(c) A man had a total of sh.65,000. Part of this money he deposited in a bank offering a compound interest of 20% per annum. The rest of the money he deposited in a bank offering a simple interest of 15% per annum. At the end of 4 years, he had a total of sh.113 472 in his two accounts. Calculate the money deposited in the two accounts. (6 marks)

2. (a) A tourist had 4100 Us dollars, 400 sterling pounds and 40 000 Japanese Yen. He toured Kenya and converted all his money into Kenya shillings in a bank charging a commission of 1% for each transaction of the money done. He spent $\frac{3}{4}$ of his money to buy goods. He reconverted back the remaining money into dollars. Using the table given, calculate how much money in dollars he received if he used the same bank for his transaction.

(9 marks)

1US dollar	=	Ksh.80
1 Sterling pound	=	Ksh.112
100 Japanese Yen	=	Ksh.71.88

(b) Kato is a businessman who owns a lorry worth sh.6million. The value of the lorry depreciates at a constant rate of 20% of its original value every year. Wakitoko is a farmer who owns a piece of land valued at sh.1.2million. The value of the land appreciates at the rate of sh.200 000 per annum. Calculate;

(i) how long it will take for the value of the pickup to be zero;
(ii) how long it will take for the land to cost sh.4 million;
(iii) the number of years the two can be able to exchange their properties without any addition of money.

(11 marks)

3. (a) Given that A, B and C are matrices and

$$A = \begin{pmatrix} x+y & x \\ 0 & -x \end{pmatrix}, \quad B = \begin{pmatrix} 2 & 0 \\ 0 & -2y \end{pmatrix} \quad and \quad C = \begin{pmatrix} 17 & -36 \\ 0 & 36 \end{pmatrix}$$

Determine the inverse of A, if AB = C. (11 marks)

(b) The 9th and 14th terms of an arithmetic progression are 240 and 365 respectively. Calculate the sum of the first 60 terms.

(9 marks)

4. (a) (i) Convert 463 into base 2

(ii) Convert 1011101_2 into base 4.

(9 marks)

(b) (i) Draw the curve $y = 2x^2 - 12x + 10$ for $-2 \leq x \leq 8$ using intervals of one unit.

(ii) Use the graph in b(i) above to solve the equation.

$2x^2 - 16x + 8 = 0$

(11 marks)

5. (a) Given the following data:

85, 11, 12, 14, 10, 12, 17, 15, 22, 31, 42, 61, 72, 83, 28

Calculate the first and third quartile. (5 marks)

(b) The masses of bearings in grammes selected from several boxes are recorded below:

Mass (g)	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 – 44
No. of bearings	7	13	25	40	15	6	4

Calculate the:

(i) mode;
(ii) mean using an assumed mean of 27g;
(iii) number of bearings with masses between 16g and 33g.

(15 marks)

6. (a) A solid frustum of a right cone of height 8cm has a top and a base of radii 6cm and 14cm respectively. Calculate its total surface area.

(11 marks)

(b) The area enclosed by the curve $y = 4x - x^2$ and the x-axis is rotated through 360°. Using Simpson's rule with 9 ordinates, calculate the volume it generates.

(9 marks)

7. (a) Solve the following equations, for $0^\circ \leq x \leq 360^\circ$

(i) $3\sin^2 x - \cos x - 1 = 0$
(ii) $10\sin 2\theta - 6\cos 2\theta = 3$

(15 marks)

(b) A triangle has lengths 42cm, 30cm and 20cm.

Calculate:

(i) smallest angle;
(ii) area of the triangle. (5 marks)

8. (a) Two forces of magnitudes 20N and 30 N are acting at a point. The angle between them is 65°.
Calculate the magnitude of the resultant force. (4 marks)

(b) The angle of elevation of a coin from the tip of a flag post is 20°. When the coin is moved 4m nearer to the foot of the flag post, its angle of elevation from the tip is 25°.
Calculate the height of the flag post. (7 marks)

(c) Draw the graph $y = 15\cos(\theta - 45^{\circ})$ for $0^{\circ} \leq \theta \leq 360^{\circ}$ using intervals of 45°. Hence use your graph to solve the equation $15\cos(\theta - 45^{\circ}) = 5$.

(9 marks)