Name:_____ Index No._____

1501/103
MATHEMATICS I
Oct./Nov. 2015
Time: 3 hours

Candidate's Signature:_____

Date:_____

THE KENYA NATIONAL EXAMINATIONS COUNCIL

CRAFT CERTIFICATE IN MECHANICAL ENGINEERING (PRODUCTION OPTION)

MODULE I

MATHEMATICS I

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.
Sign and write the date of the examination in the spaces provided above.
You should have the following for this examination:
- *Mathematical table;*
- *Non-programmable scientific calculator;*
- *Drawing instruments.*

*This paper consists of **TWO** sections; **A** and **B**.*
*Answer **ALL** the questions in section **A** and any **THREE** questions from section **B** in the spaces provided in this question paper.*
Maximum marks for each part of a question are as shown.
*Do **NOT** remove any pages from this question paper.*
Candidates should answer the questions in English.

For Examiner's Use Only

Section	Question	Maximum Score	Candidate's Score
A	1 - 10	40	
B		20	
		20	
		20	
	TOTAL SCORE	**100**	

This paper consists of 20 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

*Answer **ALL** the questions in this section.*

1. Use factorisation method to solve the equation $5x^2 + 13x - 6 = 0$. (4 marks)

2. Transpose the equation $y = \frac{pq^2}{r + q^2} - t$ to make q the subject. (4 marks)

3. Solve for x in the equation $(0.952)^{2x+1} = 7.3$, giving the answer correct to four decimal places. (4 marks)

4. The sum of the first and second terms of an arithmetic sequence is 10 and the sum of the first ten terms is 210. Determine the seventh term. (4 marks)

5. Find the equation of a line which passes point (0, -3) and is perpendicular to the line $5y - 10x + 7 = 0$. (4 marks)

6. The third and sixth terms of a geometric progression are $\frac{3}{4}$ and $\frac{3}{32}$ respectively. Calculate the sum to infinity of the geometric progression. (4 marks)

7. Use completing square method to solve the equation $2x^2 + 7x - 15 = 0$. (4 marks)

8. Without using tables or calculator, evaluate $\frac{\log 25 - \log 125 - \frac{1}{2}\log 625}{3\log 5}$. (4 marks)

9. A water tank is in the shape of a rectangular prism having length 2.5 m, breadth 75 cm and height 40 cm. Determine the capacity of the tank in:

   (i) m^3;
   (ii) litres.

   (4 marks)

10. A wholesaler bought a radio from a supplier and sold it to a retailer making a profit of 20%. The retailer later sold the radio for Ksh 1560 making a profit of 30%. Calculate the amount of money the wholesaler paid the supplier. (4 marks)

SECTION B

*Answer any **THREE** questions from this section.*

11. (a) The seventh term of a geometric progression is 1458 and the fourth term is 54. Determine the:

(i) common ratio;
(ii) first term;
(iii) sum of the first six terms.

(7 marks)

(b) In an arithmetic progression, the thirteenth term is 27 and the seventh term is three times the second term. Determine the:

(i) first term;
(ii) common difference;
(iii) sum of the first ten terms.

(7 marks)

(c) Use elimination method to solve the following linear simultaneous equations:

$$3x - 7y = 27$$
$$5x + 4y = -2$$

(6 marks)

12. (a) Solve the equation $\log_{10}(x-1) + \log_{10}(x+8) = 2\log_{10}(x+2)$. (4 marks)

(b) Solve the equation $3^{2x} - 5(3^x) + 6 = 0$. (6 marks)

(c) The stress f, in a material of a thick cylinder can be obtained from $\frac{D}{d} = \sqrt{\frac{f+p}{f-p}}$:

(i) transpose the formula to make f the subject;

(ii) hence calculate f, given that D = 21.5, d = 10.75 and p = 1800.

(6 marks)

(d) Solve the equation $\frac{x}{x+3} - \frac{2}{x-3} = 1$. (4 marks)

13. (a) Use Simpson's rule with 8 intervals to estimate the area enclosed by the curve $y = 16 - x^2$, the x - axis and ordinates $x = -4$ and $x = 4$. (6 marks)

(b) Figure 1 shows a right pyramid ABCDEF with F as the vertex. Determine the total surface area of the pyramid. (14 marks)

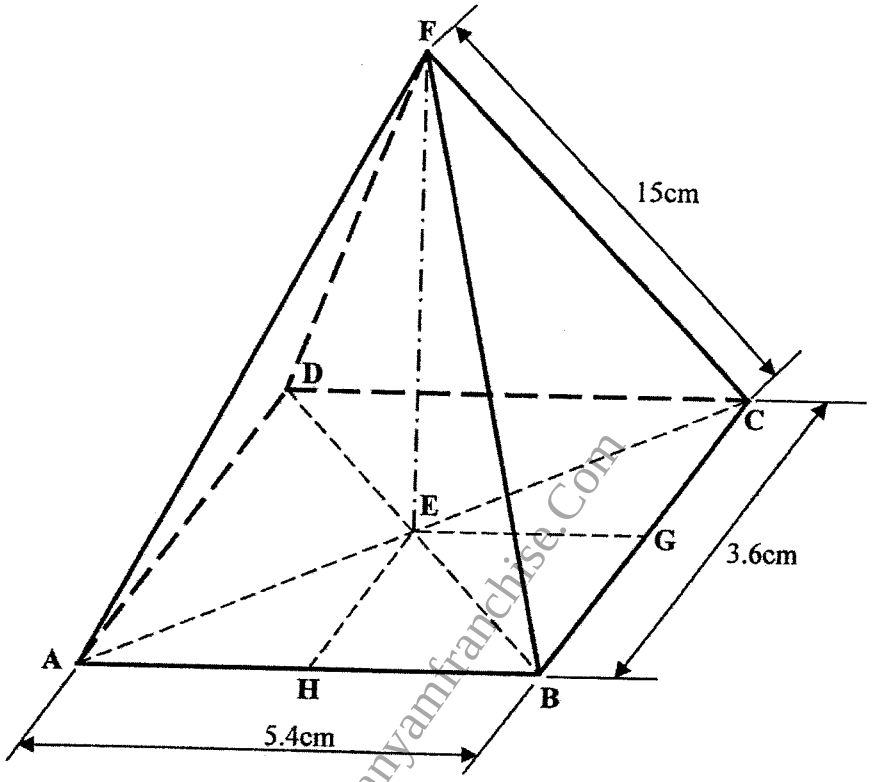

Fig. 1

14. (a) When mixing a quantity of paints, dyes of four different colours are used in the ratio of 7:3:19:5. If the mass of the first dye used is $3\frac{1}{2}$ g, determine the total mass of the dyes used. (4 marks)

(b) A metallic alloy consists of 60% copper, 25% zinc and 15% nickel. Determine the masses of the copper, zinc and nickel in 3.75 kilogram of the alloy. (4 marks)

(c) Table 1 shows data obtained from an experiment involving the variables R and V. The two variables are known to satisfy a relation $R = kV^n$, where k and n are constants.

Table 1

V	3	4	5	6	7	8
R	27	48	75	108	147	192

(i) Construct a table of values of log V and corresponding values of log R, correcting each value to 2 decimal places.

(ii) Draw the graph of log R against log V.

(iii) Use the graph to estimate the values of k and n.

(12 marks)