

1521/102  
1522/102  
1601/103  
1602/103  
MATHEMATICS  
Oct./Nov. 2016  
Time: 3 hours

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THE KENYA NATIONAL EXAMINATIONS COUNCIL  
CRAFT CERTIFICATE IN ELECTRICAL AND ELECTRONIC  
TECHNOLOGY  
(POWER OPTION)  
(TELECOMMUNICATION OPTION)  
MODULE 1

MATHEMATICS

3 hours

**INSTRUCTIONS TO CANDIDATES**

*You should have a non-programmable Scientific calculator/Mathematical tables for this examination.  
This paper consists of **EIGHT** questions.  
Answer any **FIVE** questions in the answer booklet provided.  
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) Find the sum of all the numbers between 9 and 204 which are exactly divisible by 3. (8 marks)
- (b) On commencing employment, a man is paid an annual salary of Ksh 86,400 and receives an increment of Kshs 750 every year. Determine:
- (i) his annual salary in the 9<sup>th</sup> year;
- (ii) the total he will have received in the first 12 years. (6 marks)
- (c) In a geometrical progression, the sixth term is 27 times the third term and the sum of the fourth and the fifth terms is 108. Determine the:

- (i) common ratio;
- (ii) first term;
- (iii) sum of the fifth to the tenth terms, inclusive. (6 marks)

2. (a) Find the highest common factor of 110, 286 and 330. (2 marks)
- (b) Find the lowest common multiple of the numbers 42, 56 and 140. (2 marks)
- (c) If £250 is invested at compound interest of 8% for per annum, determine:
- (i) the value after 1, 2 and 8 years respectively;
- (ii) the time it takes to reach more than £600, correct to the nearest year. (16 marks)

3. (a) Given the matrices

$$A = \begin{bmatrix} 12 & 22 \\ -14 & 15 \end{bmatrix}, \quad B = \begin{bmatrix} 12 & -15 \\ 10 & 19 \end{bmatrix}$$

- Determine:
- (i)  $4A + 3B$ ;
- (ii)  $|A|$ ;
- (iii)  $(3B + A)^T$ ;
- (iv)  $(AB)^{-1}$ ; (10 marks)

- (b) Solve the simultaneous equation using a matrix method

$$20x + 14y = 38$$

$$15x + 10y = 30$$

(10 marks)

4. (a) Evaluate:

$$(i) \sqrt{\left(\frac{10^6 \times 10^3}{10^7}\right)} \quad (3 \text{ marks})$$

$$(ii) \frac{\log 125 - \log 625 + \frac{1}{2} \log 15625}{3 \log 5} \quad (4 \text{ marks})$$

(b) Solve the equations:

$$(i) \log(x-2) + \log(x+2) = 2 \log(x+3). \quad (5 \text{ marks})$$

$$(ii) 4^{(2x-1)} = 5^{(x+2)}, \text{ correct to 4 significant figures.} \quad (8 \text{ marks})$$

$$5. (a) \text{ Simplify } 5 + \left( \frac{2\frac{2}{3} \times 3\frac{1}{2} \div 2\frac{4}{5}}{2\frac{2}{3} \times 4\frac{3}{8} \div 5\frac{1}{4}} \right) - 2. \quad (5 \text{ marks})$$

(b) Determine the number which must be added to both the numerator and the denominator of  $\frac{12}{17}$  so that the new fraction equals  $\frac{3}{5}$ . (5 marks)

(c) Without using a mathematical table or a calculator, evaluate

$$(i) \frac{27.75 \times 0.3876}{2.09 \times 0.4284} \quad (3 \text{ marks})$$

$$(ii) \frac{3a^2 - 2b^2c + 4b}{2ac + 2b^2 - 3c}$$

given that  $a = 2$ ,  $b = -1$  and  $c = 3$ . (3 marks)

(d) In a tool box, there are twice as many bolts as nuts and the ratio of the number of screws to bolts is  $\frac{4}{3}$ .

(i) If there are  $x$  nuts, write down a simplified expression in  $x$  for the total number of tools in the box.

(ii) Find the number of tools given that there are 20 screws. (4 marks)

6. Table 1 represents the frequency distribution of lengths of 150 components in centimetres cut off by an automatic guillotine machine.

Table 1

Class	0 - 15	15 - 30	30 - 45	45 - 60	60 - 75	75 - 90	90 - 105
Frequency	8	26	30	45	20	17	4

Determine the:

- (i) range; (1 mark)
- (ii) mode; (3 marks)
- (iii) Quartile deviation; (7 marks)
- (iv) Coefficient of variation. (9 marks)

7. (a) Simplify

(i)  $\frac{p^{2z} q^{5x} r^z}{p^z q^z} \div \frac{p^{3z} q^{4x} r^{3z}}{q^{5x} r^{3z}}$  (2 marks)

(ii)  $\frac{25t^2 - 36a^2}{20t^2 + 39at + 18a^2}$  (4 marks)

(b) Solve for  $x$ .

$$2^{2x+1} = 4^{3x-1} \quad (3 \text{ marks})$$

(c) Evaluate:  $\frac{\frac{1}{2} \log 256 - \frac{1}{3} \log 512}{\log 8}$  (5 marks)

(d) Convert:

(i) decimal 41 to binary. (3 marks)

(ii) decimal 0.6875 to binary. (3 marks)

8. (a) The percentage elongation for 50 samples of a wire were obtained and the results, expressed correct to the nearest 1%, shown in Table 2.

Table 2

40	41	41	43	40	42	43	41	42	42
42	40	39	42	41	42	41	41	39	40
43	42	41	41	42	41	42	42	43	42
40	43	42	44	39	43	40	41	42	41
42	41	40	40	41	44	42	40	41	42

(i) Represent the data in a frequency distribution starting with 39-40, 40 - 41 etc.

(ii) Draw a histogram from part (i) and hence obtain the median. (10 marks)

- (b) Given the data in table 3:

Table 3

28	35	61	29	38	48	57	67	69	50
48	40	47	42	41	37	51	62	63	33
31	32	35	40	38	37	60	51	54	56
37	46	42	38	61	59	58	44	39	57
38	44	45	45	47	38	38	47	47	64

- (i) Construct a frequency table using 25 – 34, 35 – 44, ... as class intervals.
- (ii) Construct a less than commulative frequency curve and obtain the values lying between 37 and 58. (10 marks)

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