

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



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 9th 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% 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) $\sqrt{\left(\frac{10^6 \times 10^3}{10^3}\right)}$ (3 marks)
- (ii) $\frac{\log 125 - \log 625 + \frac{1}{2} \log 15625}{3 \log 5}$ (4 marks)
- (b) Solve the equations:
- (i) $\log(x-2) + \log(x+2) = 2 \log(x+3)$. (5 marks)
- (ii) $4^{(2x-1)} = 5^{(x+2)}$, correct to 4 significant figures. (8 marks)
5. (a) Simplify $5 + \left(\frac{2\frac{2}{3} \times 3\frac{1}{2} \div 2\frac{4}{5}}{2\frac{2}{3} \times 4\frac{3}{8} \div 5\frac{1}{4}} \right) - 2$. (5 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) $\frac{27.75 \times 0.3876}{2.09 \times 0.4284}$. (3 marks)
- (ii) $\frac{3a^2 - 2b^3c + 4b}{2ac + 2b^3 - 3c}$
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) $\frac{p^{2x} q^{5x} r^x}{p^3 q^8} \div \frac{p^{3x} q^{4x} r^{3x}}{q^{5x} r^{3x}}$ (2 marks)

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

(b) Solve for x.

$2^{2x+1} = 4^{3x-1}$ (3 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 cumulative frequency curve and obtain the values lying between 37 and 58. (10 marks)

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