

Name: _____ Index No: _____

2920/106

Signature: _____

COMPUTATIONAL MATHEMATICS

November 2012

Date: _____

Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL

DIPLOMA IN INFORMATION COMMUNICATION TECHNOLOGY

MODULE 1

COMPUTATIONAL MATHEMATICS

3 hours

INSTRUCTIONS TO CANDIDATES

Write your name and index number in the spaces provided above.

Sign and write the date of examination in the spaces provided above.

You should have a scientific calculator for this examination.

*Answer any **FIVE** of the following **EIGHT** questions in the space provided.*

All questions carry equal marks.

For Examiner's Use Only

Question	1	2	3	4	5	6	7	8	Total Marks
Marks									

This paper consists of 19 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) (i) Define the term *dependent events* as used in probability. (2 marks)

- (ii) Mwanzo Institute presented two teams during the National ball competitions: the boys' football team and girls' volleyball team. The probability of the boys' football team winning is $\frac{3}{5}$ and the probability of the girls' volleyball team winning is $\frac{4}{7}$. Calculate the probability that:

- I. at least one team wins; (4 marks)

- II. both teams lose. (2 marks)

- (b) Differentiate between *bits* and *bytes* as used in computer systems. (4 marks)

- (c) (i) Define the term *relative frequency* as used in statistics. (2 marks)

- (ii) Table 1 shows time taken by employees to complete an activity.

Time (min)	10.0	10.5	11.0	11.5	12.0	12.5	13.0
Frequency	4	8	14	22	19	10	3

Table 1

Using assumed mean of 11.5, determine the standard deviation. (6 marks)

2. (a) (i) Define the term *leading diagonal* as used in matrices. (2 marks)

- (ii) Using the inverse method, solve the following equations

$$8x + 4y + 2z = 3$$

$$4x + 3y + z = 3$$

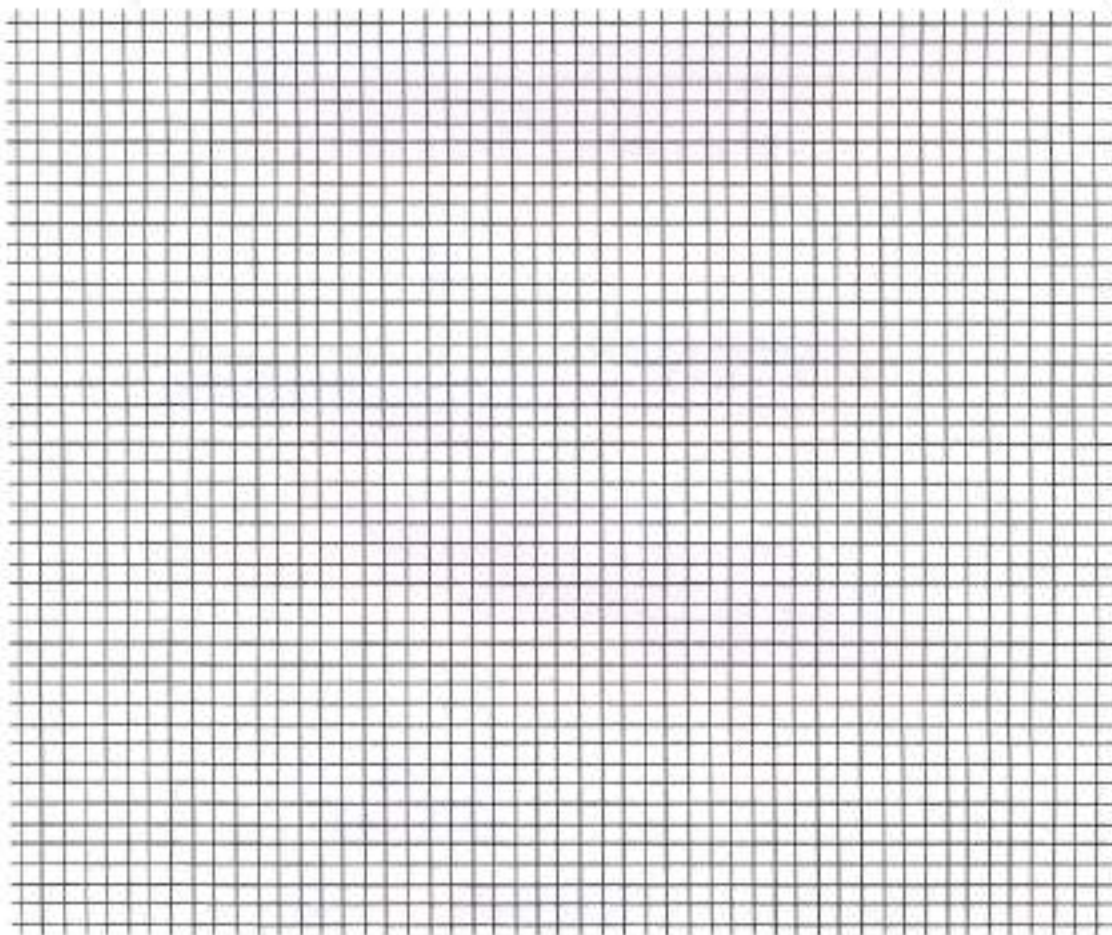
$$2x + y + 3z = 1$$

(6 marks)

- (b) Convert 1265_{10} to its octal equivalent. (2 marks)

- (c) Distinguish between *skewness* and *kurtosis* as used in statistics. (4 marks)

- (d) (i) Plot the graph of $y = 4x^2 - 8x - 21$ for values of x ranging from -2 to 4. (3 marks)



(ii) Using the graph in (i) solve $4x^2 - 10x - 15 = 0$ (3 marks)

3. (a) Convert $3C4.21F_{16}$ to its decimal equivalent. (4 marks)

(b) Table 2 shows the frequency distribution of resistance of resistors in ohms. Use it to answer the question that follows.

Range	Frequency
20.5–20.9	3
21.0–21.4	10
21.5–21.9	11
22.0–22.4	13
22.5–22.9	9
23.0–23.4	2

Table 2

Determine the mean value of resistance.

(4 marks)

- (c) (i) Define the term *column vector* as used in algebra. (2 marks)

- (ii) Using the completing square method, solve the quadratic equation $2x^2 + 9x - 5 = 0$. (4 marks)

- (d) (i) Determine the first four terms of the following expansion $\left(1 + \frac{1}{2}x\right)^{10}$. (3 marks)

- (ii) Hence find $(1.005)^{10}$ correct to 4 decimal places. (3 marks)

4. (a) Using the de Morgan's laws, simplify the Boolean expression $(A \cdot \bar{B} + C) \cdot (\bar{A} + \bar{B} \cdot \bar{C})$. (5 marks)

- (b) Figure 1 shows a logic circuit. Use it to answer the question that follows.

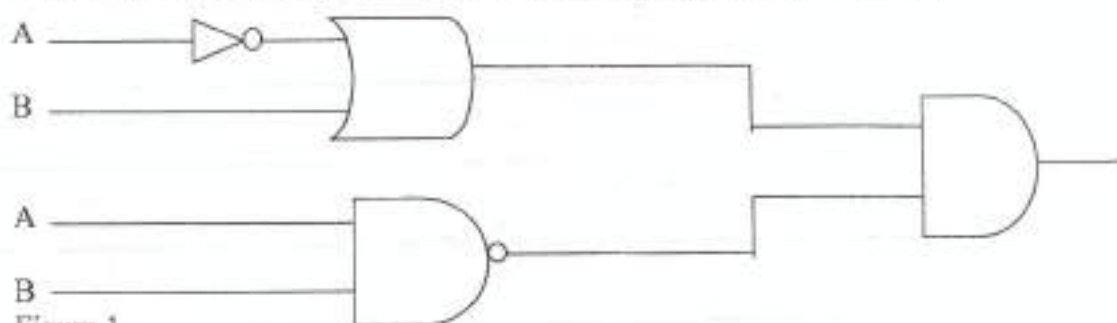


Figure 1

- Construct a truth table for the circuit. (3 marks)

- (c) The deflection y at the centre of a circular plate suspended at the edge and uniformly loaded is given by $y = \frac{kwd^4}{t^3}$ where w = total load, d = diameter of plate, t = thickness and k is constant. Calculate the approximate percentage change in y if w increased by 3 %, d is decreased by $2\frac{1}{2}$ % and t is increased by 4%. (6 marks)

- (d) (i) Define each of the following terms as used in algebra:
I. constant; (1 mark)

II. variable. (1 marks)

- (ii) Using elimination method, solve the following of simultaneous equations.

$$13x - 5y + 2z = 9$$

$$5x + 3y - z = 8$$

$$13x + 9y - 2z = 25$$
 (4 marks)

5. (a) (i) Define the term *coefficient* as used in binomial theorem. (2 marks)

- (ii) Express $\frac{1}{\sqrt{1-3x}}$ as a binomial series up to and including the 4th term. (4 marks)

- (b) Distinguish between XOR and NOT operations as used in Boolean algebra. (4 marks)

- (c) Table 3 shows values extracted from a certain expression. Use it to answer the question that follows.

x	1	2	3	4	5	6
x						
f(x)	0	19	70	171	340	595

Table 3

- Estimate $f(2.5)$ using the Gregory Newton forward difference formula. (6 marks)

- (d) A certain college purchased sports uniform in a particular town. The cost of 5 T-shirts was the same as the cost of 2 shorts. If a total of Kshs 1150 was spend on 5 T-shirts and two shorts. Determine the cost of a T-shirt and a short.

(4 marks)

6. (a) Explain each of the following types of data as used in statistics.

(i) discrete; (2 marks)

(ii) continuous. (2 marks)

- (b) A batch of laptops contains 16 working and 4 defective laptops. If 3 laptops are selected at random from the batch without replacement, determine the probability that:

(i) all three are working; (3 marks)

(ii) two are working but one is defective.

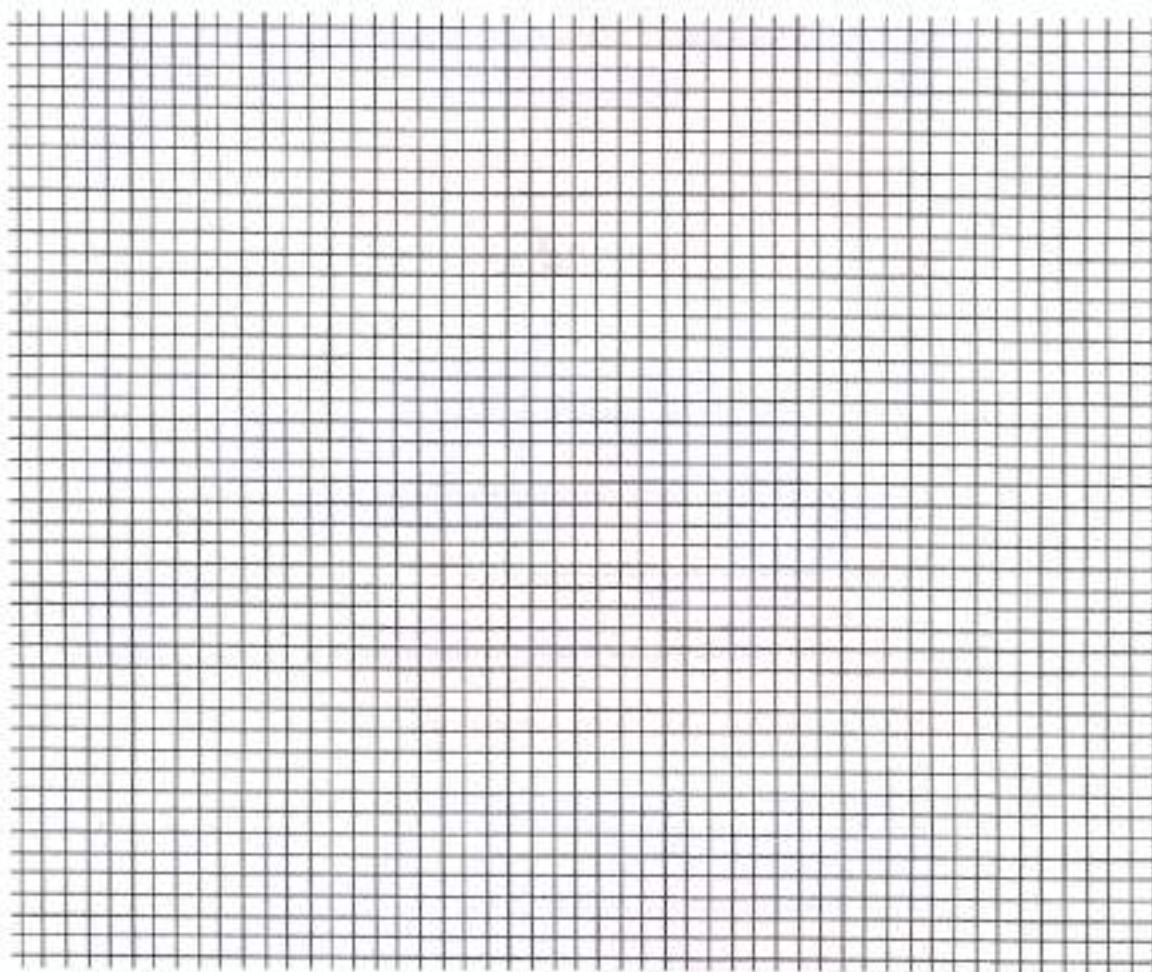
(3 marks)

(c) Using graphic method, solve the following equations.

$$3x - 2y = 0$$

$$4x + y + 11 = 0$$

(4 marks)



- (d) (i) Define the term *combination* as used in mathematics. (2 marks)

- (ii) A committee consisting of 6 members is to be formed out of 7 men and 4 women. Determine the number of committees that can be formed such that at least a third of the members are women. (4 marks)

7. (a) (i) Define each of the following terms as used in binary codes:

I. reflective codes; (2 marks)

II. non weighted codes. (2 marks)

(ii) Outline two applications of binary codes. (2 marks)

- (b) (i) State the implication of $x \in A$ in set theory notation. (2 marks)

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- (d) A train travels 150km at a constant speed. If it had travelled at 20kmh^{-1} faster then, the time for the journey would have reduced by $37\frac{1}{2}$ minutes. Determine the speed at which the train travelled. (4 marks)

8. (a) (i) Explain each of the following methods of data representation:
I. pictograms; (2 marks)

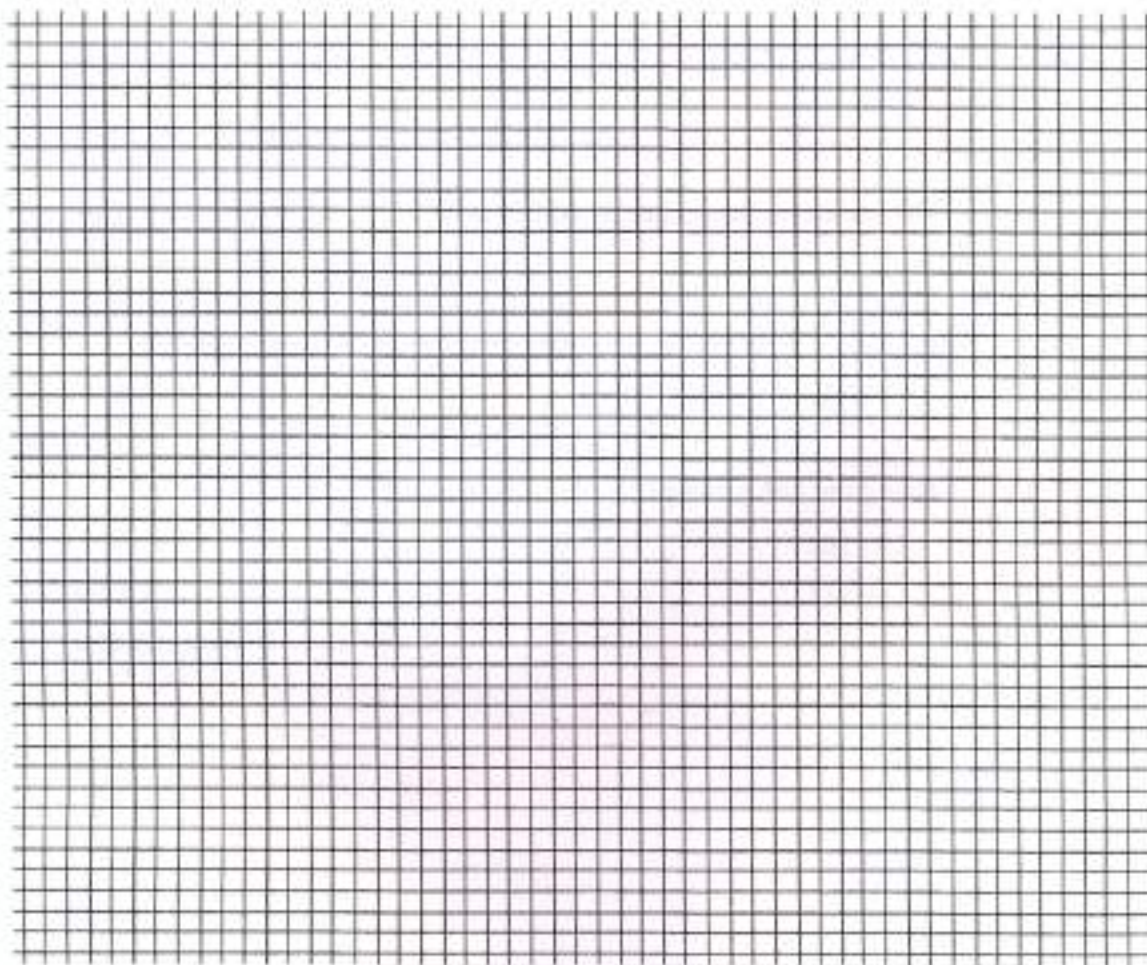
- II. bar charts. (2 marks)

- (b) The table below shows the amount of money earned per hour by casual workers in a factory. Use it to answer the questions that follow.

800	900	700	1100	900	1600	1100	800	1400	300
900	500	1000	1100	600	1000	800	900	1100	800
1000	900	1200	700	1300	1700	800	1200	1000	1100
400	1100	500	1000	1100	900	1000	700	1100	800

- (i) Using class intervals of 200 and starting with 300 prepare a frequency distribution table to represent the data (3 marks)

- (ii) Represent the data using an ogive. (3 marks)



- (c) Using Newton's Raphson's method, solve the equation $3x^3 - 10x = 14$ correct to four significant figures. (4 marks)

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- (d) (i) Outline **three** properties of ASCII code. (3 marks)

- (ii) Using the one's complement (IC), evaluate.

1101101

-110111

(3 marks)
