X. (a) (i) Outline **two** properties of *mode* as used in statistics. (2 marks)

(ii) Differentiate between the following matrices. (4 marks)

$$A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \qquad B = \begin{pmatrix} 5 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 7 \end{pmatrix}$$

(b) Explain **three** reasons that may necessitate the use of *Gray codes* as applied in computers. (6 marks)

(c) The length of a rectangular field is 10 metres less than three times the width. The perimeter of the field is 940 metres. Determine the length and the width of the field. (4 marks)

(d) Outline **two** advantages and **two** disadvantages of using *graphs* in data representation. (4 marks)

2. (a) (i) Outline **four** desired qualities of statistical units as used in data collection. (4 marks)

(ii) Table 1 shows weight distribution of children brought for clinic follow-up visits. Use it to answer the question that follows.

Weight	Frequency
0 – 10	5
10 – 20	12
20 – 30	17
30 – 40	25
40 – 50	6

Table 1

Determine the geometric mean of the children's weight. (4 marks)

(b) (i) Given the following;

$$3\begin{bmatrix} a & b \\ c & d \end{bmatrix} + 4\begin{bmatrix} 1 & -2 \\ -3 & -2 \end{bmatrix} = 2\begin{bmatrix} 1 & 0 \\ 5 & 3 \end{bmatrix}$$

Evaluate the values of a, b, c, and d. (2 marks)

Use the tree diagram to determine the following;

(i) a user successfully logs on in each of the first three attempt;(1 mark)

(ii) a user fails in the first attempt but is successful in the next two attempts; (1 mark)

(iii) a user logs on successfully only once in the last attempt; (1 mark)

(iv) a user doesn't log on successfully in the three attempts. (1 mark)

3. (a) Distinguish between a *frequency polygon* and an *ogive* as used in data representation. (4 marks)

(b) Differentiate between *absolute* and *relative* measure as used in measures of dispersion. (4 marks)

(c) (i) Dixy College conducted the end of term examinations where 25% of the students failed in mathematics;15% failed in chemistry and 10 % failed in both mathematics and chemistry. Determine the probability that a student selected at random will have passed in mathematics and chemistry (5 marks)

(ii) Perform the following binary arithmetic.

10110101 + 110011 - 11101 (3 marks)

(d) Distinguish between *spatial* and *statistical* models as used in statistics. (4 marks)

4. (a) (i) List **six** sources of *secondary data* as applied in statistics. (3 marks)

(ii) Using *matrices* solve the following simultaneous equation. (2 marks)

$3x + y = 3$

$x + 2y = 7$

(b) (i) Explain **two** characteristics of *standard deviation* as a measure of dispersion. (4 marks)

(ii) Explain each of the following terms as applied in binary codes:

I. weighted binary codes; (2 marks)

II. reflective codes. (2 marks)

(c) Figure 1 shows a logic gate, which has inputs A, B and C and output R. Use it to answer the question that follows.

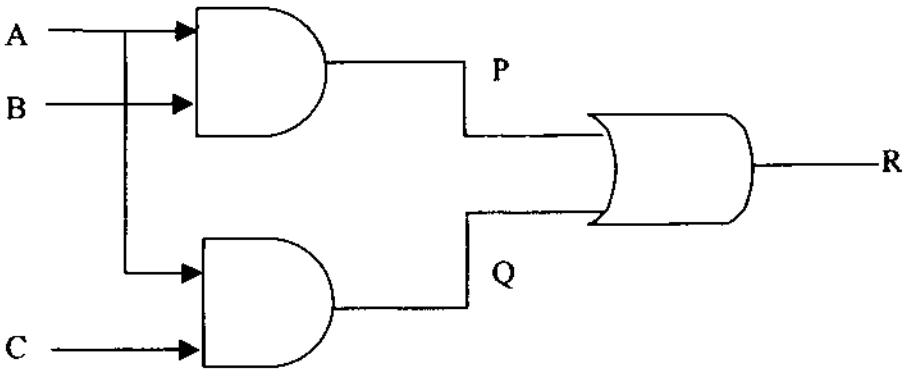

Figure 1

Using a truth table, determine the output R. (4 marks)

(d) Given that a function g takes a real number x and performs the following three steps in the order given; Subtracts 13 and square roots the result then makes the result a denominator of a fraction whose numerator is 4. Determine an expression for $g(x)$. (3 marks)