CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA IN

MATH 0121: INTRODUCTORY MATHEMATICS

STREAMS: **TIME:2 HOURS**

DAY/DATE: THURSDAY 13/04/2023 **8.30 A.M. –10.30 A.M.**

INSTRUCTIONS

Answer all questions in section A and any other two in section B.

SECTION A

QUESTION ONE (30 MARKS)

(a) Given $f(x) = 4x^3 + 3x^2 + x + 1, \quad g(x) = x^3 + 3x^2 - 4x + 5$

Find$f(x).g(x)$. (5 marks)

(b) If A $= 3, 8, 12, 16$ and $B = 7, 12, 14, 18$. Find A$\cup B$ and $A \cap B$. (3 marks)

(c) Use the Pascal's triangle to write out the expansion of$(x + 4y)^3$. (4 marks)

(d) A GP has first term 2 and common ratio 1.5. Find the sum of the first 20 terms. (4 marks)

(e) Show that $\frac{\tan\theta}{\sin\theta} = sec\theta$. (3 marks)

(f) State the properties of real numbers in the equations below.

i. $5(2 + 7) = 10 + 35$

ii. $8 + 9 = 9 + 8$

iii. $5 + 0 = 5$

iv. $7 = 7 \times 1$. (4 marks)

(g) Draw a truth table to show that$P \rightarrow Q$. (4 marks)

(h) A school committee of 9 members is to be chosen from 8 parents and six teachers and the principal. How many ways can the committee be formed in order to include the:

i) The principal and two teachers

ii) The principal and five parents. (3 marks)

SECTION B

QUESTION TWO (20 MARKS)

(a) show that $A \cap B = B \cap A$. (5 marks)

(b) Plot a graph of $y = sin\theta$ for $0° \leq \theta \leq 360°$ at an interval of 30° (3 marks)

(c)Given $f(x) = 2x^2 + 1, g(x) = 4x + 1$. Find$fog(-3)$. (5 Marks)

(d) Write out the following series in full and evaluate it. $\sum_{i=1}^{5}(2i + 5)$. (4 marks)

(e) In how many ways can the letters in the word MATHEMATICS be arranged in order for the vowels to come together? (3 marks)

QUESTION THREE (20 MARKS)

(a) In how many ways can 4 boys and 2 girls be seated in rows where (5 marks)

i). The boys and girls can seat anywhere.

ii). The two girls must seat together.

iii). The two girls must be separated.

(b) Construct a truth table to show that

$\sim P\ V \sim Q = \sim(P \Lambda Q)$ (8 marks)

(c) Evaluate the following piecewise function.

Given $f(x) = \begin{bmatrix} 2x + 5 & if\ x \leq 3 \\ x^2 + 1 & if\ 3 < x \leq 5 \\ 4x - 6 & if\ x > 5 \end{bmatrix}$

Find $f(1), f(5) and\ f(10)$. (5 marks)

(d) Draw a Venn diagram to show that the two sets are disjoint

$A = (1,3,7,5)$ And $B = (2,6,4,9)$. (2 marks)

QUESTION FOUR (20 MARKS)

(a) Find the expansion of $(2x - 3y)^5$. (5 marks)

(a) Given $Z_1 = -4 - 3i$ and $Z_2 = 3 + 2i$

Find $|Z_1 Z_2|$. (7 marks)

(b) An AP has third term 3 and fifth term 9. Find the first term and the common difference. (8 marks)
