CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATION

RESIT/SPECIAL EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE AND BACHELOR OF ARTS

MATH 122: BASIC MATHEMATICS

STREAMS: **TIME: 2 HOURS**

DAY/DATE: WEDNESDAY 05/05/2021 **8.30 A.M – 10.30 A.M**

INSTRUCTIONS:

- Answer question **ALL** questions
- Sketch maps and diagrams may be used whenever they help to illustrate your answer
- Do not write on the question paper
- This is a **closed book exam**, No reference materials are allowed in the examination room
- There will be **No** use of mobile phones or any other unauthorized materials
- Write your answers legibly and use your time wisely

QUESTION ONE

a) A large corporation classifies its many divisions by their performance in the preceding year.

Let

P = *{divisions that made a profit}*

L = *{divisions that had an increase in labour}*

T = *{divisions whose total revenue increased}*

Describe symbolically the following sets:

(i) {divisions that had increases in labour costs or total revenue} (2marrk)

(ii) {divisions that did not make a profit} (2marrk)

(iii) {divisions that made a profit despite an increase in labour costs} (2marrk)

(iv) {divisions that had an increase in labour costs and either were unprofitable or did not increase their total revenue} (2marrk)

b) Let $S = \{1; 2; 3\}$. Find all the subsets of S. (4marrks)

c) How many committees of five people can be chosen from 20 men and 12 women

(i) if exactly three men must be on each committee? (3marrks)

(ii) if at least four women must be on each committee? (3marrks)

d) Prove the identity $1 + \sin 2\theta = (\sin\theta + \cos\theta)^2$ (4marks)

e) The fourth term in an arithmetic sequence is -20, and the eighth term is -10. What is the hundredth term in the sequence? (5 marks)

f) Given h(x) = 5−9x. Find $h^{-1}(x)$ (3marks)

QUESTION TWO: (20 MARKS)

a) Prove by the Elements Argument method that

$A \cup (B \cap A) = (A \cup B) \cap (A \cup B)$ (4marks)

b) Each of the 100 students in Chuka university Pysical sciences Department, take at least one of the subsidiary units: math 100, Math 122 and math 124. Given that 65 study math 100, 45 study math 122, 42 study 124, 20 study math 100 and math 122, 25 study math

100d math 124, and 15 study math 122 and math 124.

i)Draw a venn diagram to represent the above information (4marks)

Find the number who studies:

(ii) All three subsidiary units (4marks)

(iii) Math 100 and math 122 but not math124 (4marks)

(iv) Only math 122 as a subsidiary unit. (4marks)

QUESTION THREE: (20 MARKS)

a) State the De Moivre's Theorem, hence simplify (10marks)

b) Use truth tables to show that $P \Longleftrightarrow Q$ is equivalent to $(P \Longrightarrow Q) \wedge (Q \Longrightarrow P)$ (5marks)

c) Prove that is $\sqrt{2}$ not a rational number (5marks)
