CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

SECOND YEAR EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN PHYSICS, MATHEMATICS, INDUSTRIAL CHEMISTRY AND CHEMISTRY

COSC 221: STRUCTURAL PROGRAMMING (IN C++)

STREAMS: BSC (PHYS, MATHS, INDUS CHEM & CHEM) **TIME: 2 HOURS**

DAY/DATE:

INSTRUCTIONS:

SECTION A: COMPULSORY

QUESTION 1: [30 MARKS] COMPULSORY

a) Write a code that prompts a user to enter four numbers, and then it returns the minimum number and the maximum number of the four numbers. [6 marks]

b) Define the following as used in C++ programming language [4 marks]

i) Sentinel
ii) Reference variable
iii) Structure
iv) Memory pointer

c) Differentiate between the following terms as used in programming [4 marks]

i. Call/pass by value and call/pass by reference
ii. Enumeration and union

d) Write a code that prompts a user to enter three student exams marks, then it prints the total and the average mark. [5 marks]

e) Explain what is garbage in C++ programming; hence outline how to remove/ reduce garbage

[4 marks]

f) Write a brief code to demonstrate type casting. Hence explain the need of type casting [4 marks]

g) The following is a C++ program segment. Use it to answer the question that follows;

```
int main{}
 {
 int a, b ,c, y;
 b =++a;
c=b++;
y=b+c;
return 0;
}
```

Given that the value of a is equal to 6, evaluate the value of b, c and y. [3 marks]

SECTION B: ANSWER ANY TWO QUESTIONS FROM THIS SECTION

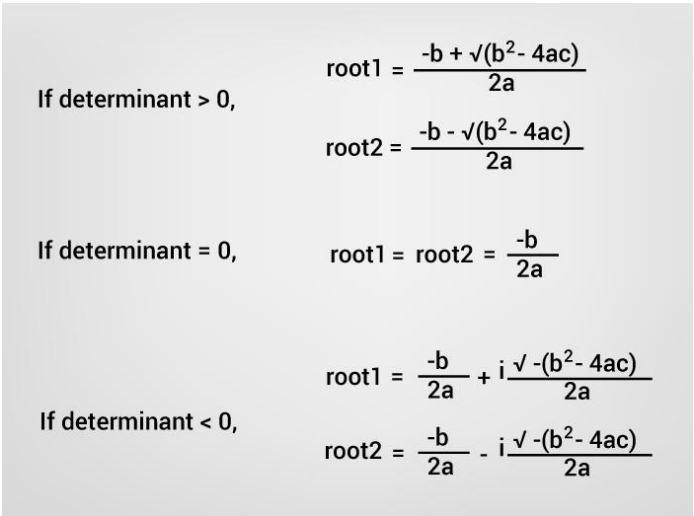
QUESTION 2: [20 MARKS]

a) For a quadratic equation $ax^2+bx+c = 0$ (where a, b and c are coefficients), its roots is given by following the formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The term b^2-4ac is known as the determinant of a quadratic equation. The determinant tells the nature of the roots, as shown below.

- If determinant is greater than 0, the roots are real and different.
- If determinant is equal to 0, the roots are real and equal.
- If determinant is less than 0, the roots are complex and different.



Write a C++ code that is going to prompt a user to enter coefficients a, b and c, then it calculates the roots of a quadratic equation, taking into consideration all the 3 determinants. [10marks]

b) Write the syntax for declaring a two-dimensional array [2 marks]

c) With reference to operators answer the following questions

   i. Write a C+ + program to demonstrate use of modulus operator, giving the solution it would provide [4 marks]

   ii. Draw the flow diagram of the above code in (i) above [4 marks]

QUESTION 3: [20 MARKS]

a) Write a C++ program that will prompt a user to enter a number. The program then determines the square root and the square of the number through a built in function and displays the result on the screen [7 marks]

b) Write a computer program that creates TWO text files (ken1 and ken2) in location "*C:\Users\User\Desktop"*. Let file ken1 contain "hello world" and ken2 contain "I am a student at Chuka University" [7 marks]

c) Explain THREE decision making techniques that can be used in C++ programming, explaining where each is more likely to be used. [6 marks]

QUESTION 4: [20 MARKS]

a) Explain FOUR relational operators used in C++. [4 marks]

b) Using functions, write a code to multiply three numbers. [4 marks]

c) Write a program that implements enumerated data type, and give the expected output [4 marks]

d) Write a C+ + program using switch/case statement that will prompt a user to choose the operation choice +, - , /, *. Then it asks the user to input two integer values for the calculation, and performs the selected operation on the entered integers. Your program should output the operation choice entered , the two numbers entered and the result [8 marks]

QUESTION 5: [20 MARKS]

a) Differentiate between the following in C++ programming [6 marks]

   i. While and do while loop

ii. Recursion and repetition
iii. User defined function and predefined function

b) Explain one advantage and one disadvantage of using in-line function in C++ programs [3 marks]

e) Using FOR loop write a C++ program to display the pattern below. [5 marks]

1 2 3 4 5
2 3 4 5 6
3 4 5 6 7
4 5 6 7 8
5 6 7 8 9

c) Assume a variable V has value 5, while another X has value 3. Assume you want to write statements to output the sum of V and X using the formats shown below. Write down the appropriate statement in each case. [6 marks]

i. The sum of 5 and 3 is 8
ii. 8 is the sum of 5, 3
iii. 5 + 3 = 8
