CHUKA UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND YEAR SECOND SEMESTER EXAMINATIONS FOR BACHELORS OF SCIENCE IN PHYSICS, MATHEMATICS, AND CHEMISTRY

COSC 221: STRUCTURAL PROGRAMMING (IN C++)

STREAMS: BSC (COMP. SCI) Y3S1 **TIME: 2 HOURS**

DAY/DATE: MONDAY 15/4/2019 **2.30 P.M. – 4.30 P.M.**

INSTRUCTIONS

1. Answer **all questions** in section A and any other **two questions** from section B.
2. No Reference Material is allowed in the exam Room.
3. All Mobile phones should be switched off in the exam room.
4. Write legibly on both sides of an answer sheet.

SECTION A (COMPULSORY)

QUESTION 1(COMPULSORY) [30 MARKS]

a) Differentiate between iteration and recursion in C++ programming. (4marks)

b) Write a C++ code which prompts a user to enter an integer and it returns both the square and the square root of the number (6marks)

c) Explain FIVE general functions used in handling files in C++ (5marks)

d) Using appropriate examples, explain the following errors: - (6marks)
   - i) Syntax error
   - ii) Run-time error
   - iii) Logical error

e) Study the code below involving structures, then answer the questions that follows: -

```
// pointers to structures
#include <iostream>
```

```
#include <string>
#include <sstream>
using namespace std;

struct movies_t
        {
         string title;
         int year;
        };

int main ()
        {
         string mystr;

         movies_t amovie;
         movies_t * pmovie;
         pmovie = &amovie;

         cout << "Enter title: ";
         //pmovie->title is the same as (*pmovie).title

         getline (cin, pmovie->title);
         cout << "Enter year: ";
         getline (cin, mystr);
         (stringstream) mystr >> pmovie->year;

         cout << "\nYou have entered:\n";
         cout << pmovie->title;
         cout << " (" << pmovie->year << ")\n";

         return 0;
        }
```

i) Highlight what does the code do
(3marks)

ii) If the code is run, write the various examples of inputs you would be prompted to enter.
(2marks)

iii) Write the various outputs that are expected, after entering the prompted inputs.
(2marks)

iv) Is there any “garbage” in this code? Explain.
(2marks)

SECTION B (Answer two question from this section)

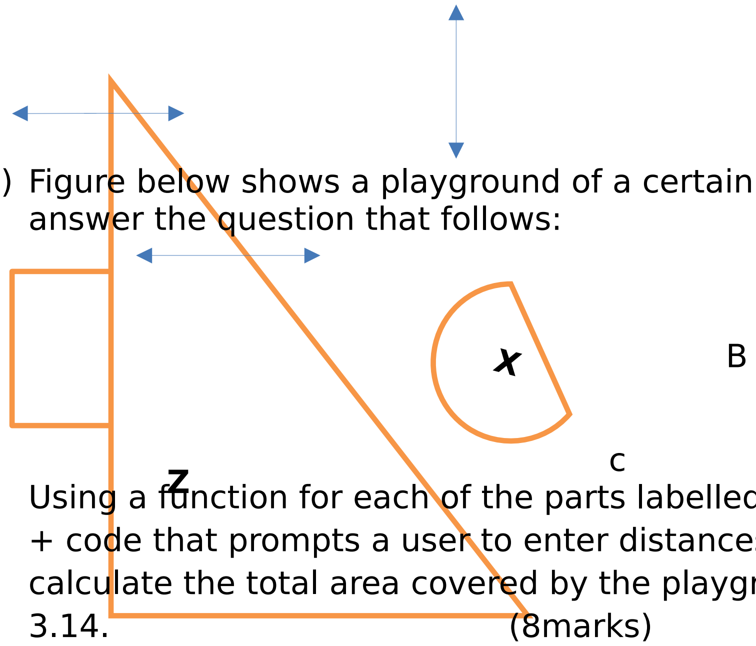
QUESTION 2 [20 MARKS]

a) Explain TWO differences between records and arrays
(4marks)

b) Explain THREE derived data types used in C++ programming
(3marks)

c) Using pie as 3.142, write a program to calculate the area of a circle into 3 decimal places. The user should enter the diameter of a circle (area=pie x radius^2) (5marks)

d) Figure below shows a playground of a certain institution. Use it to answer the question that follows:



Using a function for each of the parts labelled X, Y and Z. Write a C++ code that prompts a user to enter distances a, b and c, then it calculate the total area covered by the playground. Take pie to be 3.14. (8marks)

QUESTION 3 [20 MARKS]

a) Write a code that prompts a user to enter four numbers, then it returns the minimum number and the sum of squares of the four numbers. (8marks)

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” (7marks)

c) With reference to enumerations (enum)
   - i) Explain the benefit of enums (2marks)
   - ii) Write a syntax of enum. (3marks)

QUESTION 4 [20 MARKS]

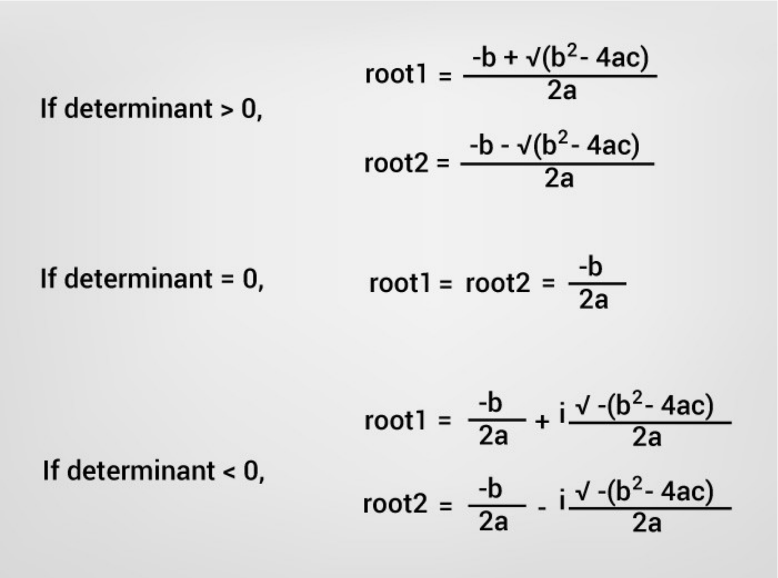
a) With regard to WHILE LOOP answer the following questions.
   - i) Write a code that prompts a user to enter two integers; the maxNumber and the MinNumber. Then using while loop, it should return all the values divisible by both 2 and 3 between the two integers inclusively. (7marks)
   - ii) Draw the flow chart of question a(i) above (3marks)

b) 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.



If determinant > 0,

$$\text{root1} = \frac{-b + \sqrt{(b^2 - 4ac)}}{2a}$$

$$\text{root2} = \frac{-b - \sqrt{(b^2 - 4ac)}}{2a}$$

If determinant = 0,

$$\text{root1} = \text{root2} = \frac{-b}{2a}$$

If determinant < 0,

$$\text{root1} = \frac{-b}{2a} + i\frac{\sqrt{-(b^2 - 4ac)}}{2a}$$

$$\text{root2} = \frac{-b}{2a} - i\frac{\sqrt{-(b^2 - 4ac)}}{2a}$$

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)

QUESTION 5 [20 MARKS]

a) Explain FIVE standard libraries usable in C++ programming.
(5marks)

b) Differentiate between a compiler and an assembler
(2marks)

c) Write a code that prompts a user to enter two numbers. It then prints all the odd numbers, separated by a tab space, between the two integers inclusively.(5marks)

d) Using arrays, write a program that prompts a user to enter the ages of six persons. It should then indicate whether the age is 18years, less than 18 years, or greater than 18 years for all the persons. (*hint:- age is an integer and should not be negative years*)
(8marks)
