THE STATE UNIVERSITY OF ZANZIBAR

DEPARTMENT OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

CS 1102 – Introduction to High Level Programming MID-TERM TEST

Date: 19/01/2021; Time allowed: 120 minutes; Total marks: 60;

Answer all questions

1. Choose the most Correct Answer **[3 marks]**
    a. What is the difference between an Algorithm and a Program?
        i. An algorithm is a conceptual idea, a program is a concrete instantiation of an algorithm.
        ii. An algorithm is limited to mathematical operation, a program can specify all kinds of operations.
        iii. An algorithm makes a slow program run fast.
        iv. An algorithm deals with computer hardware, a program deals with computer software.
    b. The two things every computer can do are:
        i. Perform calculations
        ii. Convert electricity to numbers
        iii. Display results to a screen
        iv. Remember the results
    c. What does it mean when we say that "the computer walks through the sequence executing some computation"?
        i. The computer tests each instruction to ensure it will not harm the circuitry.
        ii. The computer executes the instructions in strict, linear sequence, just like walking in a straight line.
        iii. The computer executes the instructions mostly in a linear sequence, except sometimes it jumps to a different place in the sequence.
        iv. The computer slowly executes instructions so that we can follow its progress, rather than running a program at full speed.
2. State which of the following are true and which are false. If false, explain your answers**.[5 marks]**
    a. A computational mode of thinking means that everything can be viewed as a math problem involving numbers and formulas.
    b. In order to compute everything that is computable, every computer must be able to handle the sixteen most primitive operations.
    c. The syntax of a particular computer language is a set of rules defining the grammar of that language.
    d. The following are all valid variable names: _under_bar_, m928134, t5, j7, her_sales, his_account_total, a, b, c, z, z2.

e. Comments cause the computer to print the text after the // on the screen when the program is executed.

3. Write a statement (or comment) to accomplish each of the following **[5 marks]**
   a. State that a program calculates the product of three integers.
   b. Compute the product of the three integers contained in variables x, y and z, and assign the result to the variable result.
   c. Print "The product is " followed by the value of the variable result.
   d. Read three integers from the keyboard and store them in the variables x, y and z.
   e. Print the message "Enter two numbers".
4. What does this program do?**[7 marks]**

a.
```
// bob and dole are integers
int accumulator = 0;
while (true)
{
      if (dole == 0) break;
      accumulator += ((dole % 2 == 1) ? bob : 0);
      dole /= 2;
      bob *= 2;
}
cout << accumulator << "\n";
```

b.
```
//N is a nonnegative integer
double acc = 0;
for (int i = 1; i <= N; ++i) 4
{
      double term = (1.0 / i);
      acc += term * term;
      for (int j = 1; j < i; ++j) 8
      {
            acc *= -1;
      }
}
cout << acc << "\n";
```

5. Programming Questions

a. Write a program that outputs “Hello, World!” by printing a const char * with the value “Hello, World!”. [**1 mark**]
b. Write a program that outputs “Hello, World!” n times (where n is a nonnegative integer that the user will input) with: [**6 marks**]
   i. a for loop.
   ii. a while loop.
   iii. a do...while loop
c. Given a list of N integers, find its mean (as a double), maximum value, minimum value, and range. Your program will first ask for N, the number of integers in the list, which the

user will input. Then the user will input N more numbers. Here is a sample input sequence.[**5 marks**]

d. Write a program to read a number N from the user and then find the first N primes. A prime number is a number that only has two divisors, one and itself.[**5 marks**]

e. Write a program that loops indefinitely. In each iteration of the loop, read in an integer N (declared as an int) that is inputted by a user, output N 5 if N is nonnegative and divisible by 5, and -1 otherwise. Use the ternary operator (?:) to accomplish this. (Hint: the modulus operator may be useful.) [**5 marks**]

   i. Modify the code from e so that if the condition fails, nothing is printed. Use an if and a continue command (instead of the ternary operator) to accomplish this.[**1.5 marks**]

   ii. Modify the code from e to let the user break out of the loop by entering -1 or any negative number. Before the program exits, output the string "Goodbye!". [**1.5 marks**]

f. SUM Function(Make sure to use const arguments where appropriate throughout this problem (and all the others)).

   i. Write a single sum function that returns the sum of two integers. Also write the equivalent function for taking the sum of two doubles.[**4 marks**]

   ii. Explain why, given your functions from part 1, sum(1, 10.0) is a syntax error. (Hint: Think about promotion and demotion – the conversion of arguments between types in a function call. Remember that the compiler converts between numerical types for you if necessary.) [**1 mark**]

   iii. Write 2 more functions such that you can find the sum of anywhere between 2 and 4 integers by writing sum(num1, num2, ...).[**4 marks**]

   iv. Now write just one function that, using default arguments, allows you to take the sum of anywhere between 2 and 4 integers. What would happen if you put both this definition and your 3-argument function from part 3 into the same file, and called sum(3, 5, 7)? Why? [**5 marks**]

   v. Write a single sum function capable of handling an arbitrary number of integers. It should take two arguments, include a loop, and return an integer. (Hint: What data types can you use to represent an arbitrarily large set of integers in two arguments?) [**6 marks**]