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**UNIVERSITY EXAMINATIONS
2023/2024 ACADEMIC YEAR**

**END OF SEMESTER EXAMINATIONS
FIRST YEAR SEMESTER ONE EXAMINATIONS**

**FOR THE DEGREE OF
BACHELOR OF SCIENCE COMPUTER
SCIENCE**

**COURSE CODE : CSC 1110
COURSE TITLE : COMPUTER
PROGRAMMING I**

DATE: 12/01/2024 TIME: 09:00 HRS – 11:00 HRS

INSTRUCTIONS TO CANDIDATES

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

QUESTION ONE (COMPULSORY) [30 MARKS]

- a) Define each of the following as used in computer programming; [2 Marks]
- i. Compiler
 - ii. Translator
- b) Describe the role of the following components of C program. [3 Marks]
- i) Variable
 - ii) Data Types
 - iii) Operators
- c) Write a function in C that takes in a single floating point argument. Your function should repeatedly divide the input by 2, until it is less than 1. The values returned by the function are the number of times the argument is divided by 2. [6 Marks]
- d) Write a program in C that reads in 5 integers into an array that represent the marks out of 100 that students achieved in an exam. Once the 5 numbers have been read in, your code should display 3 numbers which include the number of students that got less than 40%, the number of students that got at least 70% and the number of students that got more than 50%.

NB: Marks greater than or equal to 0 and not greater than 100 are accepted.

- e) Consider the following code fragment: [6 Marks]
- ```
int x=5;
int y=(x>5)?1:0;
```
- What is the value of y following execution of these two statements? [2 Marks]

- f) Explain the difference between the following 2 definitions. [3 Marks]

```
#define PI 3.14159
const double PI=3.14159;
```

- g) Consider the following C fragment: [4 Marks]

```
if(a==1)
{
 printf("a is 1\n");
}
else if (a==2)
{
 printf("a is 2\n");
}
else
{
 printf("a is unknown\n");
}
```

Re-Write this fragment using a switch statement.

f) Consider the following C fragment:

```
double x;
int y=4;
int z=8;
x=y/z; //statement (1)
```

- i. What value does x contain and why? [2 Marks]
- ii. Rewrite statement (1) to give the correct answer. [2 Marks]

### QUESTION TWO [20 MARKS]

- a) Using illustrations, discuss the relevance of decision control structure. [4 Marks]
- b) Rehema Limited requires a program to compute income tax and net salaries for its employees. The company offers tax relief of Kshs. 650 for single employee and Kshs. 1,110 tax relief for employees earning  $\geq 5,000$ . The relief will be deducted from the gross salary to give the taxable income. This will then be computed at the following rates:

| TAXABLE INCOME   | RATES (%) |
|------------------|-----------|
| <5,000           | 0         |
| 5,000-10,000     | 6         |
| 10,001-19,999    | 9         |
| 20,000-29,999    | 12        |
| 30,000-36,999    | 14        |
| 37,000 and above | 16        |

The tax charged is then deducted from gross income to give net salary. Write a program that will input employee's Name, PF. Number, Marital Status and gross income. The program will then compute the tax and net salary then print out the employee payslip. The payslip should contain income tax, net salary, gross income, employee name, PF. Number and Marital Status.

- i) Propose an effective algorithm to solve the problem. [4 Marks]
- ii) Give a flowchart of the above algorithm [4 Marks]
- iii) Write a C program to implement proposed algorithm. [8 Marks]

### QUESTION THREE [20 MARKS]

- a) An array is a collection of named memory locations. Discuss the relevance of arrays in programming. [2 Marks]
- b) Given the following initialization: `int numbers [5] = {45,65,34,89,80};`
- i) Write program that sorts the elements of the array. [4 Marks]
  - ii) Write program that displays the elements of the array in reverse. [4 Marks]
  - iii) Write program that returns the second largest element in the array. [4 Marks]
- c) The area of a rectangle is the product of the length and the width. Write a program that reads the length and the width of the rectangle from the keyboard, computes the area of the rectangle and displays the area on the standard output (screen monitor). [6 Marks]

### QUESTION FOUR [20 MARKS]

- a) Functions are greatly supported in C. Describe the role of functions. [4 Marks]
- b) Differentiate between recursion and iteration. [4 Marks]
- c) Write a C program to make s pattern like a pyramid with numbers increased by 1. [6 Marks]

```
 1
 2 3
 4 5 6
 7 8 9 10
```

- d) Using remainder method, write a function in C that takes a decimal number, convert it to binary and return binary equivalent. [6 Marks]

### QUESTION FIVE [20 MARKS]

- a) Writing to a file and reading from a file is an essential skill in programming. Demonstrate how this can be done. [4 Marks]
- b) Write a program to count the number of words and characters in a File. [6 Marks]
- c) Using recursion, write a program that calculates the GCD of two numbers passed to the function. [6 Marks]
- d) Using ternary operator, write a code that returns the smallest of four numbers. [4 Marks]