460

(*University of Choice*)

MASINDE MULIRO UNIVERSITY OF

SCIENCE AND TECHNOLOGY

(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

MAIN EXAM

2021/2022 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATION

FOR THE DEGREE OF BACHELORS OF SCIENCE IN

(COMPUTER SCIENCE)

COURSE CODE: **BCS 125**

COURSE TITLE: PROCEDURAL PROGRAMMING

DATE: **19/04/2022** **TIME:** **12:00-14:00PM**

INSTRUCTIONS TO CANDIDATES:

ANSWER QUESTIONS ONE AND ANY OTHER TWO.

MMUST observes ZERO tolerance to examination cheating

Paper Consists of 6 Printed Pages. Please Turn Over

QUESTION ONE (COMPULSORY) [30 MARKS]

a. Differentiate between imperative programming paradigms from declarative programming paradigms. **[3 marks]**

b. Discuss the components of <fstream> and <iostream> as used in disk files in C++ programming. **[4 marks]**

c. Differentiate between array, structure and union with appropriate C++ code segments. **[6 marks]**

d. Consider the code excerpt below:

```
1    int *myFunction( ) {
2      int r = 4;
3      return &r;
4    }
```

Explain the validity of line 3 in of the code. **[2 marks]**

e. **Figure 1** below show the structure of an arrayed named scores in computer memory.

45	78	91	51	60	59	81
31	41	51	61	71	81	73
45	55	65	75	85	86	96

Figure 1: Array of elements in computer memory.

Write a C++ code excerpt that will:

i Create and initialize the elements as they appear in the structure. **[2 marks]**

ii Compute total and mean of each row. **[3 marks]**

iii Sort the score in each row in ascending order. [Use sort function from C++ library] **[3 marks]**

f. When can we say a function has been overloaded or overridden in modular programming? Explain which a C++ code extract. **[3 marks]**

g. Consider the program below and answer the question that follows.

```
#include <iostream>
using namespace std;
int main( )
  {
     int x =10;
     int y = 3;
     const int  *const p= &x;
    *p = 35;
     p = &y;
}
```

Explain what happens when the program is compiled. **[2 marks]**

h. Differentiate between formal parameter and actual parameter. **[2 marks]**

QUESTION TWO [20 MARKS]

a. What is a recursive function? Outline the three basic credentials of a successful recursive function. **[4 marks]**

b. Write a recursive function that returns Fibonacci of the number it receives [Fibonacci is the sum of two previous Fibonacci numbers with the first number being 0 and second being 1. Fibonacci of 0 is 0, Fibonacci of 1 is 1, Fibonacci of 2 is 1 and 3, etc.] **[3 marks]**

c. Explain how break, continue and goto statements work. **[3 marks]**

d. A week has got seven days. The days are numbered from 1-7. Each day has a name with day 1 being Sunday and day 7 corresponding to Saturday. The names of the days are stored in array **names** whose structure in memory is shown in Figure 2.

names →

Sun	Mon	Tue	Wed	Thu	Fri	Sat

Figure 2: Structure of an array in memory

i Write a line of code that initializes the array **names** with name shown in Figure 2 such that is visible to all members of the week program. **[2 marks]**

ii Write a function definition that will initialize a day of the week. Day is initialized to a number between 1 and 7. **[2 marks]**

iii Write a function definition that returns the number of current day of the week. **[2 marks]**

iv Write a function definition that returns the name that corresponds to the current day of the week. If current day is 1, this method returns **Sun**. [Don't use decision statements]. **[2 marks]**

v Write a function definition that returns the name of the next day. **[2 marks]**

QUESTION THREE [20 MARKS]

a. Using relevant C++ code give the meaning and use of: **[3 marks]**

i Operators new and new[ ]

ii Operators delete and delete [ ]

b. Consider code extract below:

```
1. long are[ ]={6, 0, 9, 6};
2. long *prt =art;
3. prt ++;
4. long *ptr2 = art+3;
```

What is happening on lines 2, 3 and 4? **[3 marks]**

c. Consider a function tamplate called sum as defined below:

```
template <typename T>
T sum (const T a, cost T b)
{
return (a+b);
}
```

Writea C++ statement that will call this function and:

i Pass int arguments 1and 2. **[2 marks]**

ii Pass float arguments 1.21 and 2.43. **[2 marks]**

d. Consider program below:

```
#incude <iostream>
#include<algorithms>
using namespace std;
void printArray(const int are[ ], const int l)
{
int i= 0;
for(; i<l; i++)
cout<<" "<<are[i];
cout<<endl;
}
int main( )
{
int a[]={5, 7, 2, 1, 4, 3, 6};
sort(a,a+7);
printArray (a,7);
rotate(a, a+3, a+7);
printArray (a,7);
reverse (a, a+7);
printArray (a,7);
return 0;
}
```

Simulate the output of the program. **[3 marks]**

e. A prime number is a number that has no divisor apart from 1 and itself, example 2, 3, 5, 7,11,... write a C++ program that prints all prime number between 1 and 500.

[3 marks]

f. The Surface Area (SA) of a Cone is given by $\pi r(r + l)$ where (π) is pie which is constant, (r) is radius of the Cone and (l) is the slant height. Write a program that takes the values of r, l, as inputs and value of PI from C++ library, compute and display the Surface Area (SA) as output.

[4 marks]

QUESTION FOUR [20 MARKS]

a. What are the procedure of using file input/output in C++? **[2 marks]**

b. Give the meaning of every element of the following statement. **[2 marks]**

```
input_steam.open("number.txt");
```

c. What are the criteria necessary to read from and write to a file? **[2 marks]**

d. Explain the role of the following functions and statement. **[3 marks]**

```
ifstream fsin;
fsin.get( char & character);
fsin.eof();
ifstream fsout;
fsout.put(char character);
ios: : noreplace.
```

e.

i. You are provided with a file named data.txt having the following numbers 50-120. Write a C++ program that will read this file data and print it to other three files even, odd and prime in even.txt, odd txt and prime txt respectively. **[5 marks]**

ii. Modify the program so that the output are oriented on the console window. **[4 marks]**

iii. Why it is not mandatory to check whether even.txt, odd txt and prime.txt files exist as the case of data.txt during file operation in part e (i) above. **[2 marks]**

QUESTION FIVE [20 MARKS]

a. Explain how C++ memory management works. **[2 marks]**

b. Explain how the following concepts are handled in C++.

i Memory Leaks **[2 marks]**

ii Garbage Collection. **[2 marks]**

c. Explain what each of following achieves. **[3 marks]**

```
1. int b[5];
2. int *bptr;
```

```
3. bptr=b;
4. bptr= &b[0];
5. *(bptr +3);
6. *(b+3);
7. b+=3;
```

d. Consider the program below.

```
#include <iostream>
using namespace std;
enum colors{red=5, black};
enum suit{heart, diamond=8, spade=3, club};
int main() {
  cout <<"The value of enum color : "<<red<<","<<black;
  cout <<"\nThe default value of enum suit :"
<<heart<<","<<diamond<<","<<spade<<","<<club;
  return 0;
}
```

Trace the output of the program. **[2 marks]**

e. What is the difference between standard and extended API in C++? **[2 marks]**

f. Is there any differences between a recursive function and an iteration statement? Explain.

[3 marks]

g. Using a loop construct of your choice. Write a C++ program that evaluates the following series.

$$\sum_{i=1}^{100} \frac{1}{i^2} = \frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} \cdots + \frac{1}{100^2}$$

[4 marks]