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Computer Science Department
Final Exam 2017-2018
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First Year – Second Term
Date: May 31st , 2018
Time: 180 minutes
Course: CSW150
Total: 90 points

Fundamentals of Structured Programming Using C++

Please attempt ALL questions, **separate them clearly**, and think before you write.

QUESTION (1)	**(10 points)**	***(20 mints)***

1.1 Type True/False in front of each statement and CORRECT the false ones. Use the following template table for your answer.

Answer	Correction of False statements
1.1. True/False	…
1.2. True/False	…

(1) According to Visual Studio compiler, this code is accepted:
const double n=3; int myArr[n]={0}; (F)

*const **int** n=3; int myArr[n]={0};*

(2) If we input the following name **"Bill James"** to the console, the output would be **"Bill Jame"**.

```
struct Date{ int year; int month; int day;};
struct Person{ char name[10]; Date birthDay;};
void main(){Person Bill; cin>>Bill.name; cout<<endl<<Bill.name<<endl;}
```
(F)

Bill

(3) Recursive functions work faster than their iterative counterparts. (F)
The opposite

(4) Arguments are variables that are passed to functions during function call. (T)

(5) C++ is considered a low-level language. (F)
High-Level

(6) The following code segment outputs ***rubbish*** on the console :

```
struct Examstruct { int num1, num2;} var1;
void main(){cout<<var1.num1<<endl;}
```
(F)

Zero

(7) Overloaded functions are functions having the same name and the same formal parameters. (F)
Different Formal Parameters

(8) To avoid the existence of a ***Dangling*** Pointer we should delete the dynamically allocated pointer. (F)
Set Pointer to Null after deletion

(9) Using methods/functions in your program is a way of applying ***Divide and Conquer technique.*** (T)

(10) The following statement de-allocates 1D dynamic array:

```
delete []arr;
```
(T)

QUESTION (2)	**(15 points)**	***(20 mints)***

Choose the correct answer (ONLY ONE). (5 points each)
PLEASE FOLLOW THIS ANSWER FORMAT:

Question Number	Answer
2.1	Your choice letter
2.2	Your choice letter
…	…

(1) What is the output of the following code fragment? Assuming that the address of the dynamically allocated integer is : 00E9C2D8

```
1  #include <iostream>
2  using namespace std;
3  void main()
4  {
5      int *p2 , *p1= new int;
6      *p1=100;
7      p2=p1;
8      delete p2;
9      cout<<p1<<"\t"<<*p2<<endl;
10 }
```

(a) 00E9C2D8 00E9C2D8 **(b)** 00E9C2D8 100
(c) Runtime Error **(d)** Garbage 100
(e) 00E9C2D8 Garbage

(2) What is the output of the following code fragment? Assume that z is found in address: 003CF790

```
1  #include <iostream>
2  using namespace std;
3  void main()
4  {
5      int *x , *y, z=10 ;
6      x=&z;
7      y=x;
8      *x++;
9      cout<<z<<"\t"<<*x<<endl;
10 }
```

(a)10 Garbage **(b)** 11 11
(c) 10 11 **(d)** 11 003CF790
(e) Runtime Error

(3) void my_Function(int myArr[ ], int size);
myArr is passed by:
(a) The code has syntax error.
(b) Value.
(c) Reference.
(d) The code has runtime error.
(e) None of the above.

(4) double myArr[3];
double *myPtr=myArr;
for(int i=0; i<3;i++)
cin>> ? **;**

We can replace ? by
(a) myArr[i] **(b)** myPtr[i]
(c) *(myPtr+i) **(d)** *(myArr+i)
(e) All of the above

(5) int[] myFunction( )
{ int myArr[5]={0};
return myArr; }
This code:
(a) has a syntax Error, we cannot return an array.
(b) has a logical Error.
(c) is missing the size of the array in the return type.
(d) has a runtime Error. **(e)** None of the above.

QUESTION (3)	**(25 points)**	***(25 mints)***

Answer the following questions, illustrate your final answer CLEARLY

(1) What is the output of the following code fragment?

```
int myfun(int y)
{
    cout<<y<<endl;
    if (y==1)
        return 1;
    return myfun(y-1);
}
void main()
{
    myfun(5);
}
```

5\n4\n3\n2\n1

(2) What is the output of the following code fragment?

```
void main()
{
    string s1="Good luck in your exam!";
    string s2="exam";
    string s3="testing";
    int counter=0;
    int index=s1.find(s2);
    for(int i=index;i<index+s2.length();i++)
        s1[i]=s3[counter++];
    cout<<s1<<endl;

}
```

Good luck in your test!

(3) The following code is not working well, may you help this poor developer to find and fix the two mistakes he/she has made? *(In the answer sheet write only the line numbers that have the mistakes and its correction)*

```
void input(Employee x)
{   cout<<"Enter employee id, name and salary:\n";
    cin>>x.id;
    getline(cin,x.name);
    cin>>x.salary;
}
void display(Employee x)
{   cout<<x.id<<"\t"<<x.name<<"\t"<<x.salary<<endl;
}
void main()
{   Employee emp1;
    input(emp1);
    display(emp1);
}
```

Hint: *The mistakes are not in the #include*

line#10 &x
line#13 cin.ignore()

(4) For the following program, write down the missing code for the de-allocation of the used matrix. *(In the answer sheet Write down ONLY the missing code)*

```
void main() {
  int r = 3, c= 4;
  int** matrix = new int*[r];
  for(int i = 0; i < r; ++i)
      matrix[i] = new int[c];
  for(int i = 0; i < r; ++i)
    for(int j = 0; j < c; ++j)
       cin>>matrix[i][j] ;
   for(int i = 0; i < r; ++i)
    for(int j = 0; j < c; ++j)
      cout << matrix[i][j] << "\n";
  //de-allocate matrix
  //i).....
  //ii).....
  //iii).....
  //iv).....
}
```

i) for(int i = 0; i < r; ++i)
ii) delete [] matrix[i];
iii) delete [] matrix;
iv) matrix=NULL;

(5) What is **the expected output** of the following pseudo-code if we input **(4 , 4.8, 3.5, 5, 2.5)?**

```
WHILE index<numOfElements - 1
  SET the first element of the current sub-list as currentImportant
  FOR each of the elements in the current sub-list
    IF element > currentImportant
    THEN SET element as currentImportant
    ENDIF
  ENDFOR
  SWAP currentImportant element with the first element of the current sub-list
ENDWHILE
```

5, 4.8 , 4, 3.5, 2.5

QUESTION (4)	**(35 points)**	***(60 mints)***

Problem:

Spending ONE-WEEK vacation happily requires a lot of preparations. One of which is how to reserve a good rated hotel that fits your budget. We need to help in deciding which hotel to pass your vacation in.

Write a program that takes the details of hotels (name, rating, pricePerNight) **in a dynamic array of structs**. Then ask the user how much he is willing to pay per week.

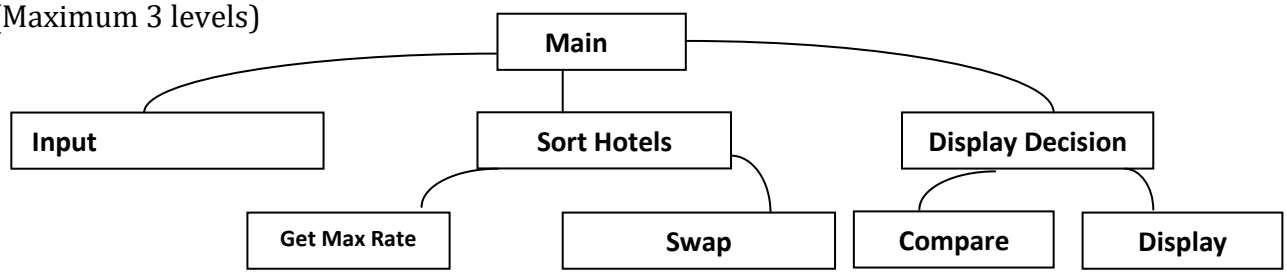
Depending on the user's answer, the program should print a **sorted list by rating** of the recommended hotels information (name, priceperWeek, rate) that **ONLY fit the user's budget** (equal to or less than the user's week-budget).

Sample Run:

```
How many Hotels?
3
Hotels details:
# Name    Rating(5) Price/Night
1 Sheraton    4      1000
2 Hilton      4.8    950
3 Baron       3.5    750
What is your budget for a whole week?
6700

Recommended Hotels fitting your budget are:
#       Name     Rate     TotalCost
1       Hilton   4.8      6650L.E
2       Baron    3.5      5250L.E
Press any key to continue . . .
```

(1) Use **top-down** approach to suggest a design for a solution of the mentioned problem. (Maximum 3 levels)



(2) Write the definition of the following three C++ functions:

- **`void input(hotel* arr ,int size);`**
- **`void sortHotels(hotel* arr, int size);`**
- **`void displayhotels(hotel* arr, int size, int budget);`**

Hint:

*The **`input()`** function is responsible to input the hotels information.*

*The **`sortHotels()`** function is responsible for sorting the hotels dynamic array according to the ratings in descending order.*

*The **`displayhotels()`** function displays the recommendations for the user according to his budget sorted by the one with the best rating first.*

```
void input( hotel* arr ,int size)
{
       cout<<"Hotels details:"<<endl;
       cout<<"# Name    Rating(5)
Price/Night\n";
    for(int i=0; i<size; i++)
    {
              cout<<i+1<<" ";
              cin>>arr[i].name;
         cin>>arr[i].rating;
         cin>>arr[i].pricePerNight;
    }
}
```

```
void displayhotels(hotel* arr, int size, int pay)
{
        int counter=1;
        cout<<"Recommended Hotels fitting your budget
are:\n";
        cout<<"#\tName\tRate\tTotalCost\n";
    for(int i=0; i<size; i++)
    {

        arr[i].weekbudget=arr[i].pricePerNight*7;
        if(arr[i].weekbudget<=pay)
        {
                cout<<counter++<<"\t";

        cout<<arr[i].name<<"\t"<<arr[i].rating<<"\t"<<
arr[i].weekbudget<<"L.E"<<endl;

        }
    }
}
```

```
void sortHotels(hotel* arr, int size)
{
	for(int currentPosition=0;currentPosition<size;currentPosition++)
	{

		int maxIndex = currentPosition;
		for(int j = currentPosition ; j < size ; j ++)
		{
			if(arr[j].rating > arr[maxIndex].rating)
				maxIndex = j;
		}
		//swap step
		hotel temp = arr[currentPosition];
		arr[currentPosition] = arr[maxIndex];
		arr[maxIndex]= temp;

	}
	cout<<endl;
```

(3) Write the **main()** function of your program to solve the Problem using the 3 functions defined in **(2)**.

```
struct hotel
{
    char name[30];
    float rating ;
    float pricePerNight;
    float weekbudget;
};
void main()
{
    int size;
    cout << "How many Hotels?"<<endl;
    cin>>size;
    hotel* arr=new hotel[size];
    input(arr,size);
    float budget;
    cout<<"What is your budget for a whole week?"<<endl;
    cin>>budget;
    sortHotels(arr,size);
    displayhotels(arr,size,budget);
   delete []arr;
   arr=NULL;
}
```

(4) Add to your code an overloaded function for the **sortHotels()** function that sorts the hotels dynamic array according to the Price per night in an ascending order.
(Hint: *Write only the function definition, NO need to call it in* ***main( ))***

```
//overloaded function
void sortHotels(hotel* arr, int size,bool byPrice)
{
	for(int currentPosition=0;currentPosition<size;currentPosition++)
	{

		int minIndex = currentPosition;
		for(int j = currentPosition ; j < size ; j ++)
		{
			if(arr[j].pricePerNight < arr[minIndex].pricePerNight)
				minIndex = j;
		}
		//swap step
		hotel temp = arr[currentPosition];
		arr[currentPosition] = arr[minIndex];
		arr[minIndex]= temp;
	}
	cout<<endl;
}
```

QUESTION (5)	**(5 points)**	***(10 mints)***

Write a short description of your role in the project you participated in with your team in the practical part of this course.

- Briefly discuss (in points) how you would like to enhance your project in the future.

Best Wishes ☺

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