0068

National University of Computer and Emerging Sciences

Object Oriented Programming (CS1004)

Sessional-I Exam

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Total Time: 1 Hour
Total Marks: 40
Total Questions: 02

Semester: SP-2024
Campus: Lahore
Dept: FAST School of Computing

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IMPORTANT INSTRUCTIONS: Answer in the space provided. **Answers written on rough sheet will not be marked.** Do not use pencil or red ink to answer the questions. In case of confusion or ambiguity make a reasonable assumption.

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CLO # 4: Apply good programming practices

Q1: [4x5 = 20 marks] **Short Questions**

Part (a) Write output of the code segment below. (There is no syntax error in the code.)

```
#include <iostream>
using namespace std;

void Swap(int*& a, int*& b) // swaping points
                               not value
{
        int* temp = a;
        a=b;
        b=temp;
}
```

```
void main()
{
        int a=5;              a = 5
        int b=10;             b = 10
        int* ptr1 = &a;       ptr1
        int* ptr2 = &b;       ptr2   ptr3
        int** ptr3 = &ptr1;
        cout<<"Data = "<<**ptr3<<endl;
        int* temp1 = ptr1;
        int* temp2 = ptr2;
        Swap(temp1, temp2);
        cout<<"-------------"<<endl;
        cout<<"*ptr1 = "<<*ptr1<<endl;
        cout<<"*ptr2 = "<<*ptr2<<endl;
}
```

Output:
```
Data = 5
---------
*ptr 1 = 5
*ptr 2 = 10
```

Part (b): Write output of the code segment below. If there is any error, clearly mention the error. (There is no syntax error in this code.)

```
#include <iostream>
using namespace std;

int* SomeFunction()
{
        int abc = 50;// Doesnt exist any
        return &abc;
}

void main()
{
        int* ptr1 = SomeFunction();
        cout<<"Data = ";
        cout<<*ptr1<<endl;
}
```

Output/Error:

Data =
Error at "cout<<*ptr1<<endl" as it is a dangling pointer and is pointing at value that doesn't exist anymore

Part (c) Write the output of the code segment given below. (There is no syntax error in this code.)

```
#include <iostream>
using namespace std;

void SomeFunction(int* arr, int size) {
    int* ptr1 = arr;
    int* ptr2 = arr + size - 1;
    while(ptr1 < ptr2) {
        *ptr1 = *ptr2;
        ptr1 = ptr1+2;
        ptr2--;
    }
}
```

```
int main() {
    int nums[] = {1, 2, 3, 4, 5, 6, 7, 8, 9, 10};
    int* ptr = nums;
    SomeFunction(ptr, 10);
    for(int i = 0; i < 10; ++i) {
        cout << nums[i] << " ";
    }
    return 0;
}
```

Output:

10 2 9 4 8 6 7 8 9 10

Part (d) For the code segment given below, write output/error. In case of crash, highlight the line where program will crash. (There is no syntax error in this code.)

[THIS QUESTION IS NOT FOR BCS-2C]

```
#include <iostream>
using namespace std;

int* GetData(int xyz)
{
        int* ptr = 0;
        if(xyz%2 == 0)
        {
                ptr = new int[5];
                for(int i=0; i<5; i++)
                        ptr[i] = i+1;
        }
        return ptr;
}
```

```
int main() {
        int* array1[10];
        for(int i=0 ; i<10 ; i++)
        {
                array1[i] = GetData(i);
        }
        for(int i=0; i<10; i++)
        {
                for(int j=0; j<5 ; j++)
                {
                        array1[i][j] = array1[i][j] *2;
                        cout<<array1[i][j]<<" ";
                }
                cout<<endl;
        }
        //Assume we have Deallocation code here that
//successfully deallocates the memory.
}
```

Output/Error:

2 4 6 8 10

—Da

25 4 6 8 10

24 6 8 10

2 4 6 8 10

2 4 6 8 16

Dangling pointer, trying to acces mem that isnt exist (program will crashes (willing output j in case)

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Part (d) *[FOR BCS-2C ONLY]* 2 4 6 8 10

Consider the following program, **give C++ code for the class Point.** The distance formula is d = sqrt(dx*dx + dy*dy). The function sqrt is available in the C++ standard library.

```
int main() {
  Point p1(10,20);
  Point p2(30,50);
  cout << p1.distance(p2);
  return 0;
}
```

Solution:

2D array to del

sizes of 2Da

Ar

```
void FilterData(int**& ListOfIntArrays, int*& LenghtsOfArrays, int*& ArrayToFind, int& SizeOfArrayToFind, int&
TotalIntArrays)  → No left
{
//Start your code here...
    int temp = 0;    int* tempSizes = new int [~~Total~~ Total int arrays]    //all needs to be updated
    for(int i=0; i<Total Int Arrays; i++)
    {   int count = 0;
        if ( LengthOf Arrays[i] <= Size Of ArrayTo Find)
        {
            Delete[] ~~int~~ ListOfIntArrays[i];   // Deletes array smaller than or equal to array to find bcz they don't need
        }
        else
        {
          for ( int j = LengthOf Arrays[i]-1, k = Size of Array to Find-1;
               k>=0; k--, j--)
          {  ~~if(~~[i] [j] ==~~
             if(ListOfIntArrays [i] [j] == ArrayToFind[k]
             { count ++}     // check if all elements at the end are same
             else
             { ~~break;~~ Delete[] List of in Arrays[i]; // if last element is not same deletes it
             }
// This condition runs if last elements are same //
             if (count == Size of ArrayToFind)
             {  int* temparr = new int [~~length~~ of Arrays[i]-
                                          Size of Array TO Find];
                temp++;
             for (int l=0; l< ~~l~~ lengths of Arrays[i] - Size of Array
                 To Find; l++)
             {
                   temp[~~l~~] = List of Int Array [i][l]   //make a copy
             }
// creates a temp array and fill it with only needed elements
             List of Int Arrays[i] = temp[l]; //now point towards the heap
             ~~*tempSizes~~ = Lengths of Arrays[i] - Size of Array to Find // arr to store sizes
          }  } // if terminates
      } // minor for terminates
    } // else terminates
} // main for loop term
```

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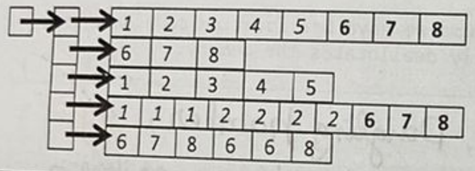
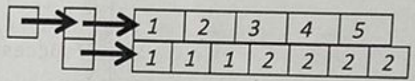
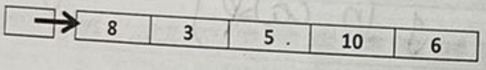
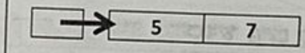
CLO # 3: Model an algorithmic solution for a given problem

Q2: [20 marks]

A program is getting multiple integer arrays (each array of variable size). It needs to keep only those arrays which end with a specific subArray. Your task is to write a function that takes a ListOfIntArrays (int**) and an ArrayToFind (int*) i.e. SubArray. The function should remove all the arrays (from ListOfIntArrays) that do not end with ArrayToFind. Prototype of the function is given below:

void FilterData(int& ListOfIntArrays, int*& LenghtsOfArrays, int*& ArrayToFind, int& SizeOfArrayToFind, int& TotalIntArrays)**

Sample run below shows the values of required variables and arrays' content before and after the function call for **ArrayToFind = {6,7,8}** and **SizeOfArrayToFind = 3**.

Before Function Call	**After Function Call**	**Explanation**
ListOfIntArrays:  1 2 3 4 5 6 7 8 6 7 8 1 2 3 4 5 1 1 1 2 2 2 2 6 7 8 6 7 8 6 6 8	**ListOfIntArrays:**  1 2 3 4 5 1 1 1 2 2 2 2	All the arrays that do not end with ArrayToFind = {6,7,8} have been removed. The array that ends with {6,7,8} but does not have any other data has also been removed.
TotalIntArrays: 5	TotalIntArrays: 2	Total no. of int arrays in ListOfIntArrays
LenghtsOfArrays:  8 3 5 10 6	LenghtsOfArrays:  5 7	Array Containing Lengths of all 1D int arrays in ListOfIntArrays.

Functionality Explanation:

Row 1, {1,2,3,4,5,**6,7,8**}: <u>Not Removed</u>, as ArrayToFind {6,7,8} found at the end.
Row 2, {**6,7,8**}: <u>Removed</u>, as ArrayToFind {6,7,8} found at end but there wasn't any other data in this array.
Row 3, {1,2,3,4,5}: <u>Removed</u>, as ArrayToFind {6,7,8} NOT Found at the end.
Row 4, {1,1,1,2,2,2,2,**6,7,8**}: <u>Not Removed</u>, as ArrayToFind {6,7,8} found at the end.
Row 5, {6,7,8,6,6,8}: <u>Removed</u>, as ArrayToFind {6,7,8} NOT Found at the end.
Note that the data of ArrayToFind {6,7,8} has also been removed from original data arrays (ListOfIntArrays).

<u>Make sure that arrays do not consume extra space. Also there should not be any memory leakage or dangling pointer.</u>

```
} Total Int Arrays = temp;
  ~~for~~
  int * tempB = new int [temp]
  for(int i=0; i<temp; i++)
  {   tempB[i] = tempSizes[i]
  }
  Lengths of arrays = tempB;

}
```

// changes the values of all other arrary and member funcdas needed store befor in temps etc