National University of Computer and Emerging Sciences

FAST School of Computing **Fall-2020** **Islamabad Campus**

CS-217: Object Oriented Programming

Wednesday, 15th October, 2020

Course Instructors

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Serial No:
Sessional Exam 1
Total Time: 1 Hour
Total Marks: 60

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Signature of Invigilator

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Student Name Roll No Section Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use the back of the last page for rough work.
3. If you need more space write on the back side of the paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have seven (7) different printed pages including this title page. There are a total of 5 questions.
5. Calculator sharing is strictly prohibited.
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.

	Q-1	Q-2	Q-3	Q-4	Q-5	Total
Marks Obtained						
Total Marks	**12**	**12**	**12**	**16**	**8**	**60**

Question 1 [12Marks]

(a) Given the following code snippet, create a pointer to the given pointer **(ptr)** named **ptr_to_ptr,** then print the value stored in variable 'x' using this newly created **ptr_to_ptr:** [1 Marks]

```
int      x = 10;
int*     ptr = &x;
int** ptr_to_ptr = &ptr;
cout<<**ptr_to_ptr;
```

(b) Given the following code snippet, what will be the output? [1 Marks]

```
int      x = 100;
int      y = 200;
int      *p = &x, *q = &y;
p = q;
cout<<*p;
```

output: 200

(c) Given the following code snippet, what will be the output? [2 Marks]

```
char     arr[20];
int      i;
for ( i = 0; i < 10; i++ )
*(arr + i) = 65 + i;              // '65' is ASCII code of 'A'
*(arr + i) = '\0';
cout << arr;
```

output: ABCDEFGHIJ

(d) Given the following code snippet, what will be the output? [2 Marks]

```
char     *ptr;
char     arr[ ] = "abcdefgh";
ptr = arr;
ptr + = 5;
cout << ptr;
```

output: efgh

(e) Given the following code snippet, what will be the output? (Assuming memory address of variable 'x' is 01434CC3.) [2 Marks]

```
int      x = 50;
int      *ptr = &x;
ptr  =  ptr + 1;
cout << ptr;
```

output: 01434CC7

(f) Given the following function: [1 + 1 Marks]

```
int test(int x, int y)
{
        if (x == y)
                return x;
        else if (x > y)
                return (x + y);
        else
                return test(x + 1, y - 1);
}
```

What will the output of the following statements?

(i) cout << test(5, 10) << endl;

output: 15

(ii) cout << test(3, 9) << endl;

output: 6

(g) Given the following code snippet, are there any bugs/errors in the program? If yes, identify and correct them. Moreover, if there are any violations of best programming practices concerning memory management, identify and correct them too.
[1 + 1 Marks]

```
int  n;
cout << "enter value of n between 10 – 20:";
cin >> n;
int arr[n];
int ptr = new int[n];
int *ptr = new int[n];
for (int i = 0; i < n; i++)
      ptr[i] = rand() % 100;
```

delete [ ] ptr;
ptr = NULL;

Question 2 [12 Marks]

What is the output of the following C++ code? Assume that the address of A is 100 (in decimal for ease) and an integer requires four bytes of memory.

```
#include <iostream>
using namespace std;
int main() {

 int x[4][4] = { {10,20,30,40},{60,70,80,90}, {5,15,25,35}, {55,65,75,85}
};

      cout << x+1 << endl; //write your output here: 116

      cout << x + 3 << endl; // write your output here: 148

      cout << *(x + 2) <<endl; // write your output here: 132

      cout << **(x + 1)<<endl; // write your output here: 60

      cout << *(x + 3) + 2<<endl;// write your output here: 156

      cout << **(x + 2) + 5; // write your output here: 10
}
```

Question 3 (a) [4 Marks]

What will be the output of the following program? [2+2 Marks]

```
#include <iostream>
using namespace std;
    void funct(int* x, int* y)
    {
        x = y;
        *x = 200;

    }

    int main() {
        int i = 10;
        int j = 20;
        funct(&i, &j);
        cout << "i is = " << i << endl;// write your output here: 10

        cout << "j is = " << j << endl; // write your output here: 20

        return 0;
     }
```

Question 3 (b) [8 marks]

Complete the following program as mentioned in the comments and print the output as required.

```
#include <iostream>
using namespace std;
int main() {
    // use the following dimensions of an array
    int N = 4;
    int M = 4;

    // write code for dynamic allocation of 2-D array A. [1 marks]

     int ** A = new int * [N];
     for (int i=0; i<N; ++i)
      A[i]=new int [M];

    // Assume that you have populated the array as following.
    for (int i = 0; i < N; ++i)
        for (int j = 0; j < M; ++j)
            A[i][j] = i+5;

 //Use pointer arithmetic and print the output of the following statements
//[5 marks]

    cout << **A<<endl;// write your output here: 5

    cout << *(*A + 2)+1<<endl; // write your output here: 6

    cout << **A+100<<endl; // write your output here: 105

    cout << *(*A + 2)+20<<endl; // write your output here: 25

    cout << **A + 30; // write your output here: 35
   // write your code to De-allocate the dynamic memory of 2-D array.
    //[2 marks]


     for (int i =0; i<N; ++i)
     delete[]A[i];
     delete[]A;


    return 0;
}
```

Question 4 [16 Marks]

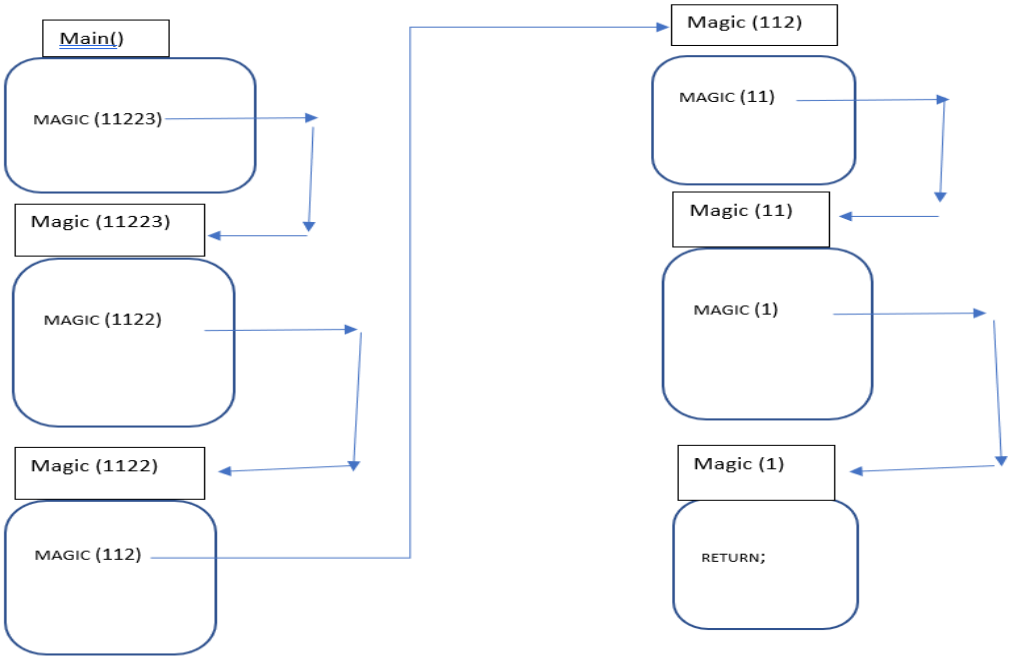
Consider the following recursive function and answer the following questions:

```
int magic(long value)
{
      if ((value < -9) || (value > 9))
      {
            return (1 + magic(value / 10));
      }
      else
            return 1;
}
```

1) Give complete Trace and Dry Run (using functions copies and Stack) of function Magic when it is called from main() function as follows: [8 Marks]

```
int main()
{
      long check = 11223;
      cout<<magic(check);

      return 0;
}
```



2) Identify recursive case / call and base case of the ***magic()*** function? [2]

Recursive case = if ((value < -9) || (value > 9))
Base case = else part of if i.e.,((value >= -9) && (value <= 9))

3) How many copies of ***magic()*** function will be created in the above call from ***main()*** function. [2]

5

4) What will be the output produced by the statement ***cout<<magic(check)*** in the main function. [1]

5

5) What is the purpose of ***magic()*** function? [1]

Count number of digits passed to it as parameter.

Question 5 [8 Marks]

Write a recursive function **sumofArray()** that adds contents of an integer array? [8 Marks]

```
int sumofArray(int a[], int size)
{
      if (size == 0)
      {
            return 0;
      }
      else
            return (sumofArray(a, size - 1) + a[size -1]);
}
```