National University of Computer and Emerging Sciences

School of Computing **Spring 2023** **Islamabad Campus**

CS-1004 Object Oriented Programming BS(DS) BS(AI)

Monday, February 27, 2023

Course Instructors

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Serial No:

Mid-I Exam

Total Time: 1 Hour

Total Marks: 80

Signature of Invigilator

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. Last pages are available for rough work.
3. If you need more space write on the last paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have (**12**) different printed pages including this title page. There are total of (**3**) questions.
5. Use of calculator 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.
7. Use **proper indentation** while writing code and make sure that your code is legible. Failing to do so can cost you marks.
8. Please read the question thoroughly and use your time **properly**, an uneven distribution of time can lead to incomplete answers.

	I	II	III	**Total**
Total Marks	50	20	10	80
Marks Obtained				

Question I . . . . . (50 Marks)

Answer the following questions. In case of output/dry-run, only the code of main function is written without return 0 statement, So please don't identify these errors. Write answers on the line(s) given at the end of each part.

Assumptions for dry-run or output:

- uninitialized variable has value zero in beginning.
- an integer variable takes 4 bytes, float 4 bytes, double 8 bytes and char takes 1 byte.

(a) **(1 Mark)** How much memory a pointer to character variable takes?

(b) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF10.

```
char* p1="Hello World";
int * p2;
cout << sizeof(p1)-sizeof(p2);
```

(c) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF20.

```
char* p1="Hello World";
cout << &p1[5]-p1;
```

(d) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF30.

```
int a = 57;
int* ptr = &a;
int*&pptr = ptr;
cout<<*pptr;
```

(e) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF40.

```
int arr[5]={5,2,6,4,7};
int *p = arr + 1;
int *p1 = p + 3;
cout<<p - p1<<endl;
```

(f) **(3 Marks)** What is the output of the following program segment? Identify errors (if any).

```
int check[26]={0};
const char* word =new char[20];
word ="MaiPakistanHun";
int i=0;
while(word[i]!='\0')
{
    check[int(word[i]-'a')]++;
    i++;
```

```
}
for(int i=0;i<26;i++)
{
   cout<<char(i+97)<<":"<<check[i]<<" ";
}
```

(g) **(3 Marks)** What is the output of the following program segment? Identify errors (if any).

```
char** d_p[] = {str+3, str+2, str+1, str};
char*** t_ptr[] = {d_p,d_p+1};
char**** f_ptr;
cout<<"1\n";
for (int i=0;i<4;i++)
    cout<<**(d_p+i)<<"\n";
cout<<"2\n";
cout<<***t_ptr<<"\n"<<***(t_ptr+1)<<"\n";
cout<<"3\n";
f_ptr = t_ptr;
cout<<***f_ptr<<"\n"<<***(f_ptr+1)<<"\n";
```

(h) **(3 Marks)** What is the output of the following program segment? Identify errors (if any).

```
bool test(int n)
{
    if (n < 4)
    {
        test(test(++n));
    }
    cout<<n<<endl;
    return n;
}
int main()
{
    cout << test(2);
    return 0;
}
```

(i) **(4 Marks)** What is the output of the following program segment? Identify errors (if any).

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

```

```
bool status(char* str, int st, int en){
   if(st>=en) return true;
   if(str[st]!=str[en]) return false;
   return status(str,st+1,en-1);
}
int main(){
   char * str = "racecar";
   int s = 7 ;
   if(status(str,0,s-1))
      cout << "Status true";
   else
      cout << "Status false";
   return 0;
}
```

(j) **(3 Marks)** What is the output of the following program segment? Identify errors (if any).

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

void inc(int *p) {
  (*p)++;
}

int main() {
  int a[] = {1, 2, 3, 4, 5};
  int *p = a;
  inc(p++);
  cout << *p << endl;
  return 0;
}
```

(k) **(3 Marks)** What is the output of the following program segment? Identify errors (if any).

```
#include <iostream>
using namespace std ;
int main() {
  int x = 5;
  int *p = &x;
  int **q = &p;
  int ***r = &q;
  cout << ***r << endl;
  ***r = 10;
  cout << x << endl;
  return 0;
}
```

(l) **(3 Marks)** What is the output of the following program segment? Identify errors (if any).

```
#include <iostream>

int main() {
  int a[] = {1, 2, 3, 4, 5};
  int *p = a + 2;
  int *q = a;
  *(q++) = *(--p);
  cout << *(++p) << endl;
  cout << *(++q) << endl;
  return 0;
}
```

(m) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF10.

```
char p1[]="Hello World";
for(int i=0; i<5;i++)
{
    p1++;
    cout << *p1;
    }
```

(n) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF10.

```
int p1[]={5,9,12,14,72};
for(int i=0; i<5;i++)
    cout << *p1+i<<" ";

```

(o) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF10.

```
int arr[]={5,9,12,14,72};
int *p2=arr;
for(int i=0; i<5;i++){
    p2++;
    cout << *p2+i<<" ";
    }
```

(p) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume starting address of array is 0xFF10.

```
int arr[]={5,9,12,14,72};
int *p2=arr+5;
for(int i=0; i<5;i++){
    p2--;
    cout << *p2+i<<" ";
    }
```

(q) **(2 Marks)** What is the output of the following program segment? Identify errors (if any). Assume address of x variable is 0xFF50 and address of p2 is 0xFF70.

```
int x=5;
int *p2=&x;
cout << (**&p2);
```

(r) **(1 Mark)** What is the output of the following program segment? Identify errors (if any). Assume address of x variable is 0xFF50 and address of p2 is 0xFF70.

```
int x=5;
int *p2=&x;
cout << (&*p2);
```

(s) **(1 Mark)** What is the output of the following program segment? Identify errors (if any). Assume address of x variable is 0xFF50 and address of p2 is 0xFF70.

```
int x=5;
int *p2=&x;
cout << (&*&*x);
```

(t) **(1 Mark)** What is the output of the following program segment? Identify errors (if any). Assume address of x variable is 0xFF50 and address of p2 is 0xFF70.

```
int x=5;
int *p2=&x;
cout << (*&*&*x);
```

(u) **(1 Mark)** What is the output of the following program segment? Identify errors (if any). Assume address of x variable is 0xFF50 and address of p2 is 0xFF70.

```
int x=5;
int *p2=&x;
cout << (*&*&x);
```

(v) **(1 Mark)** For the code given below

```
int a=5, b=9;
const int *p;
p = &a;
```

Is it necessary to initialize p at the time of declaration? Has this code error?

- ◯ *Yes*
- ◯ *No*

(w) **(1 Mark)** For the code given below

```
int a=5, b=9;
const int *p = &a;
```

Which of the following statements are not allowed for this declaration of pointer.

- ◯ **p=12;*

- ◯ *p=&b;*
- ◯ *All of the above*
- ◯ *None of the above*

(x) **(1 Mark)** For the code given below

```
int a=5, b=9;
int * const p = &a;
```

Which of the following statements are not allowed for this declaration of pointer.

- ◯ **p=12;*
- ◯ *p=&b;*
- ◯ *All of the above*
- ◯ *None of the above*

(y) **(1 Mark)** For the code given below

```
int a=5, b=9;
const int * const p = &a;
```

Which of the following statements are not allowed for this declaration of pointer.

- ◯ **p=12;*
- ◯ *p=&b;*
- ◯ *All of the above*
- ◯ *None of the above*

(z) **(1 Mark)** For the code given below

```
int a=5, b=9;
int *p = &a;
```

Which of the following statements are not allowed for this declaration of pointer.

- ◯ **p=12;*
- ◯ *p=&b;*
- ◯ *All of the above*
- ◯ *None of the above*

Question II ..... **(20 Marks)**

(a) **(5 Marks)** What will be the output of following code. You will have to draw the calling stack as well.

```
#include <iostream>
using namespace std;
int CTD(int, int, int);
void main()
{  int n=12343, b=5;
cout<<CTD(n, 1, b)<<endl;
return 0;  }
int CTD(int n, int t, int b)
{ if(n > 0)
return (n % 10)*t + CTD(n/10, t*b, b);
return 0; }
```

(b) **(8 Marks)** Write a recursive function in c++ which takes an integer as argument and returns the sum of those digits which are less than 5.

sumOfDigitsLessThan5(165482) will return 7 because digits less than 5 are 1, 4, 2 and their sum is 7.

```
int sumOfDigitsLessThan5(int n){
//write body of this function
}
```

(c) **(7 Marks)** Write a recursive function ***printSeries*** in c++ which takes an integer(n) as argument and print the number from 1 to n.

printSeries(10) will print 1 2 3 4 5 6 7 8 9 10

Question III ..... (10 Marks)

(a) **(5 Marks)** Suppose you are working on a project that involves developing a program for a restaurant that allows customers to place their orders. You have been asked to implement the code that handles the order processing.

The restaurant serves a variety of dishes, each with a unique name, price, and ID number. The customer can select one or more dishes and specify the quantity for each. The program should calculate the total cost of the order and display it to the customer. To implement this functionality, you decide to use arrays to store information.

For example, you may use an array to store the ids, another array to store the prices and a 2D array to store the name of the products. To store the orders received you can note the information in a 2D array named Orders by noting the product ID and quantity in an order.

You also create a function calculateOrderTotal that takes the required data from the above mentioned arrays as argument. The function should calculate the total cost of the order and return it.

Write the implementation of the calculateOrderTotal function using pointers. Your implementation should handle cases where the quantity of a dish ordered is zero, and should ignore those dishes in the calculation. You can assume that the arrays passed in as arguments are of equal length.

Your implementation should also handle cases where the arrays are empty or null, and should return zero in those cases.

(b) **(5 Marks)** Consider an array of integers, where each element represents a weight at a scale. You are given two pointers to the beginning and end of the array, respectively, and a target weight that you need to achieve by selecting a combination of weights. Write a recursive function in C++ that takes these pointers and the target weight as input and returns a boolean indicating whether it is possible to achieve the target weight using the given weights. For example, given the following array of weights:

[45, 35, 25, 10, 5, 2.5]

And a target weight of 100, the function should return true because it is possible to achieve a weight of 100 using 45, 25, 25, and 5. Note: You can assume that the array is sorted in descending order and that it contains at least one weight less than or equal to the target weight. You may use additional helper functions if needed.