8

Quiz # 3

Programming Fundamentals (S ... Roll Numb...

Fall 2021 Semester Date: 09-October-2021 (Saturday)

Max. Time Allowed: **10 Minutes** Max. Marks: **10**

NOTE: Use the given space to write down the answers. Name: ...

Q. 1: What is the final value of x? 2 [2 Marks]

```
b = yourRollNumber;
x = b % 4 + 3;
if (x >= 0)
  x += 5;
if (x >= 5)
  x += 2;
```

5160

5160 / 4 = 1290, Remainder = 0, 0 + 3 = 3

3 > 0

8

10

Q. 2: It is decided to base the fine for speeding in a built up area as follows - 500 Rupees if speed is between 31 and 40 km/h, 800 Rupees if the speed is between 41 and 50 km/h and 1000 Rupees if his speed is above 50 km/h. Write a code segment to compute the fine after getting input from the user. 3 [3 Marks]

```
#include<iostream>
using namespace std;
int main()
{ float speed=0;
  cout << "Enter the speed in km/h" <<endl;
  cin >>speed;
  if (speed >= 31 and speed <=40)
    cout << " Fine is 500 Rupees" <<endl;
  Else if (speed >= 41 and speed <=50)
    cout <<" Fine is 800 Rupees" << endl;
  Else if (speed >= 50)
    cout << " Fine is 1000 Rupees" <<endl;
Else (speed < 31)
  cout << "No Fine";
```

else (see Speed < 31)
cout << " No Fine

Q. 3: Write down a C++ program that asks the user to enter the speed in mph (miles per hour) and converts it into m/s (meter per second). Note that there are 1609 meters in a mile and 3600 seconds in an hour. 3 [5 Marks]

1609 mile = 1 meter

5 = x

x / 1609

Speed / 1609 ÷ 1x3600

Speed / 1609 ÷ 3600

```
{
  float speed=0;
  float x=0;
  cout <<"Enter speed in miles per hour" <<endl;
  cin >> speed;
  x = Speed/(1609 * 3600);
  cout << "Speed in meters per second is" <<endl;
  cout << x;
```

BODMAS

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Quiz # 4

Programming Fundamentals (BCS-1N)

Fall 2021 Semester

Max. Time Allowed: **15 minutes**

NOTE: Use the given space to write down the answers.

Roll Number: _____

Date: **29-October-2021 (Friday)**

Max. Marks: **10**

Name: _____

7

1. What output will be generated when the following C++ program codes are executed?

```
int main()
{
      int i=7;
      int j=i;

      while (--i>0){
            while (--j>0)
                  cout << i;
            cout << endl;
            j=i;
      }
      return 0;
}
```

i>0	i	j	j>0
T	6	6	T
T	5	5	T
T	4	4	T
3
2
1

Output

6
5
4
3
2
1

2. Use nested loops that print the following pattern.

1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
1 2 3 4 5 6

```
#include <iostream>
using namespace std;
int main()
{
  int rows = 1;
  int i = 1;
  while (rows <= 6)
  {
     while ( i<= rows)
      cout << i;
    ++i ;
  }
  rows= rows+1;
  cout <<endl;
  return 0;
}
```

rows = 1
i = 1

```
while (rows <= 6)
  while (i <= rows)
    cout << i;
    i++;
```

i j	i>0	j	j>0
7 7	T

i j	i>0	i	j	j>0
7 7	T	6	6	T
6 6	T	5	5	T
5 5

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National University of Computer and Emerging Sciences, Lahore Campus

	Course:	Programming Fundamental Lab	Course Code:	CL-1002
	Program:	BS (Computer Science)	Semester:	Fall 2021
	Duration:	120 Minutes	Total Marks:	30
	Paper Date:	20-Nov-21	Weight	25 %
	Section:	1N	Page(s):	3
	Exam:	Lab Midterm	Roll No.	

Instruction/Notes:

- Make sure your submitted file is not corrupted.
- In case of ambiguity, take suitable assumption.
- Plagiarism will result in severe consequences.
- Indentation and commenting holds marks
- Lastly, do not forget to stay confident.

GOOD LUCK ☺

Question No. 01 (Arithmetic operations):

Marks: 5

Write a program in C++ that receives a number from user as input and print the sum of first and last digit of given number as output. For example, when user input 5661, the output should be sum of 5 & 1 which are first and last digits. For single digit input add the same digit with itself.

Input Validation: Do not accept negative values.

Question No. 02 (Filing):

Marks: 10

File "quiz_result.txt" stores the result of three quizzes of different students. The format of the file is shown below. The first column in the file lists the names of the students, the second lists the marks of first quiz out of 10 marks, third column lists the marks of second quiz out of 10 marks and fourth column is for third quiz out of 10 marks. Write a program, which reads the marks of all the quizzes for each student, and calculate and display the total marks obtained by each student and also display status "PASS" if marks are greater or equal than 40% of the total marks, or "FAIL" if less than 40%.

Please note that you don't have to write your output in a file.

Input File:

```
Shahzaib  2 3 4
Huda      10 9 8
Fareeha   2.5 1 0
Abdullah  3 3 5
.
.
.
```

Output Display:

```
Shahzaib  9    FAIL
Huda      27   PASS
Fareeha   3.5  FAIL
Abdullah  11   FAIL
.
.
.
```


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Marks: 15

Question No. 03 (Functions):

You are supposed to write a program for a Hotel to make bills for the customers. To print a bill for a customer, the program takes as input the number of days the customer stayed, Category of room reserved by customer, number of meals taken by the customer. The program should then perform following tasks to make a bill.

Calculate Basic Charges: The room changers are calculated according to the category of the room. There are 4 categories of rooms named as category A, B, C and D. The basic charges for a room are calculated by multiplying the number of the days of stay with the charges per day of the room. The basic charges of the room per day are as follow.

Category	Rate per day
A	Rs.1000
B	Rs.2000
C	Rs.4000
D	Rs.8000

Calculate Meal Charges: At the hotel all meals are of same cost. Each meal costs 80 Rupees. The Meal charges are simply calculated by multiplying the number of meals taken by customer with the cost of one meal.

Calculate Tax: The total charges of staying at hotel also include the tax. The tax is calculated as the total of basic tax and stay tax. The basic tax is calculated by adding the Basic charges and meal charges and calculating 10% of the total. The formula for basic tax is 10% of (Basic charges + Meal charges). The stay tax is fixed rate of Rs. 40 per day, and calculated as 40 multiplied by number of days of stay. So the total tax is equal to basic tax + stay tax.

The charges calculated as above are finally added to make total dues.

Write functions for each of the above tasks. The functions should also display the calculated charges. The main function of the program should take all inputs and should only display the total dues.

2064 + 20640 + 200

20 000
640

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LAB QUIZ # 2

Name: _____ Roll No.: _____

Problem 1:

Write a program in which write a user defined value returning function with following name:

Function: BinarytoDecimal()

This function must take a binary number and then return a decimal number after the conversion. Use the program format given on next page.

Sample Output:
Input a binary number: 1011
The decimal number: 11

2^7 2^5 2^4 2^3 2^2 2^1

1 0 1 1 1 1 1 1

1
2
4
8
16
32
64

127

Note:
You can use any loop.
The result must be saved in a separate variable.
Cannot use built in functions.
Input and output statements should be in main function.
Let's assume the user will always enter binary number.
For any confusion feel free to ask.

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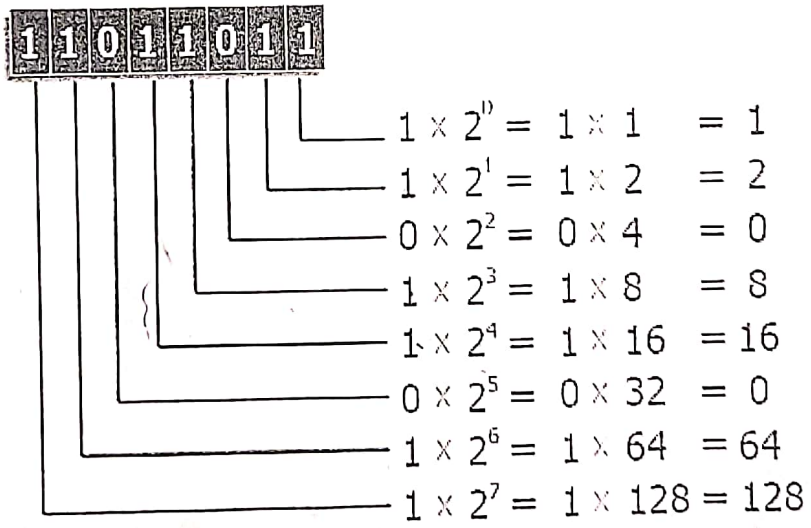
```
#include <iostream>
using namespace std;

int BinaryToDecimal (int bin);        //function prototype

int main()
{
        //declare required variables
        //prompt for entering a binary number
        //receive the binary number from the user into the variable
        //function call to convert the binary to decimal
        //display the equivalent decimal number.
        retum 0;
}

//heading of the function
//function body that converts Binary to Decimal
```

Binary to Decimal



$$1 + 2 + 8 + 16 + 64 + 128 = 219$$

$$(\mathbf{11011011})_2 = (\mathbf{219})_{10}$$

num 1 , num 2 , num 3.

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Quiz # 7

Programming Fundamentals (BCS-1N)

Fall 2021 Semester

Max. Time Allowed: **10 minutes**

NOTE: Use the given space to write down the answers.

Roll Number: _____

Date: 17 – December – 2021 (Friday)

Max. Marks: 10

Name: _____

9.5

A picture of 100 x 50 pixels is taken from satellite and stored as a two-dimensional array of numbers. Each number represents a level of brightness of each pixel. Due to transmission errors, some of these values may be incorrect. Your job is to write a function that receives the array through its parameters and detects and corrects those errors. Assume a value is in error if it differs by more than one from each of its four neighboring values. Skip the error detection on the edges (first and last row and first and last column). For all other pixels, detect if the value is incorrect and then correct it by giving it the average of its neighboring values, rounded to the nearest integer. For example in the scenario presented below, 2 would be considered to be in error and would be given a corrected value of 5.

4	5	5
5	2	5
4	4	4

```
#include<iostream>
using namespace std;
int main()
{
    int arr[100][50];
    cout<<"Enter elements of Array"<<endl;
    for(int i=0; i<100; i++)
    {
        for(int j=0; j<50; j++)
            cin>>arr[i][j];
    }
    pixel(arr);
    return 0;
}
Void pixel(int arr[][50])
{
    float avg;
    for(int i=1; i<99; i++)
    {
        for(int j=1; j<49; j++)
        {
            if((arr[i][j]-arr[i+1][j])>1 || (arr[i][j]-arr[i+1][j])<-1
            && (arr[i][j]-arr[i-1][j])>1 || (arr[i][j]-arr[i-1][j])<-1
            && (arr[i][j]-arr[i][j+1])>1 || (arr[i][j]-arr[i][j+1])<-1
            && (arr[i][j]-arr[i][j-1])>1 || (arr[i][j]-arr[i][j-1])<-1)
            {
                cout<<arr[i][j]<<" is error"<<endl<<"Corrected value is";
                avg=(arr[i+1][j]+arr[i-1][j]+arr[i][j+1]+arr[i][j-1])/4.0;
                arr[i][j]=round(avg);
```

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9+1

Quiz # 5

Programming Fundamentals (BCS-1N)

Fall 2021 Semester

Max. Time Allowed: **20 minutes**

NOTE: Use the given space to write down the answers.

Roll Number: _____

Date: **15-November-2021 (Monday)**

Max. Marks: **10**

Name: _____

Q. # 1: The series for computing **sinh (x)** is as follows: [Marks: 6]

$$\sinh x = \sum_{n=0}^{\infty} \frac{x^{2n+1}}{(2n+1)!} = x + \frac{x^3}{3!} + \frac{x^5}{5!} + \cdots \quad \text{for all } x$$

Write a C++ function that gets x as its input parameter and returns **sinh (x)** to the calling function.

Assume that you have two value-returning functions **pow (x, y)** and **factorial (x)** available.

```
//function that returns hyperbolic sine value of the input angle.

double sinh (double x)
{
     //function body starts here
     double a, result=0;
     result = x ;
     for (int y = 3; count = 2 ; count <= 10 ; count ++ )
      {
            a = (pow(x,y))/(factorial(y)) ;
           result = result + a;
           y = y+2;

      }
      return result;
}
int main()
{
     double num, answer;
     cout << " Enter the number " <<endl;
     cin >> num ;
     answer = sinh (num) ;
     cout << " sin( " << num << " )= " << answer ;
return 0;
}
```

5+1

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Q. # 2: Following program calls a function **Bin2Dec()** to convert a binary number into decimal.

Dry run the given code (in the space provided) when this function is called as shown below. **[Marks: 4]**

```
#include <iostream>
#include <cmath>
using namespace std;
int Bin2Dec(int);
int main()
{
    int decimal = Bin2Dec(110101);
    cout << decimal << endl;
    return 0;
}
int Bin2Dec(int bin)
{
    int dec = 0;
    int x = 0;
    while (bin)
    {
        dec+=(bin%10)*pow(2,x++);
        bin/=10;
    }
    return dec;
}
```

Table for DRY RUN (First iteration is already shown.)

	dec	bin	x	bin==true?
Initially	0	1 1 0 1 0 1	0	T
1	1	1 1 0 1 0	1	T
2	1	1101	2	T
3	5	110	3	T
4	5	11	4	T
5	21	1	5	T
6	53	0	6	F

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National University of Computer and Emerging Sciences, Lahore Campus

Course Name:	Programming Fundamentals	Course Code:	CS-1002	
Degree Program:	BS(CS-SE-DS)	Semester:	Fall 2021	
Exam Duration:	60 Minutes	Total Marks:	20	
Paper Date:	2-Dec-2021	Weight		
Section:	ALL	Page(s):	5	
Exam Type:	Midterm-2			

18.5/20

Student: _____ Section: _____

Instruction/Notes: Answer in the space provided. Show all working. ROUGH SHEETS NOT ALLOWED. Good luck!

Question1. Write the output of the following program: [10 Points]

```
char f2 (char& a, char& d, int& m)
{
    int n;
    a = d + 5;
    a += 1;
    n = m + 5;
    cout << "a" << a <<"+"<< d;
    cout << "m" << m <<"+"<< n << endl;
    return a;
}

void f1 (char& b, char c, int& k)
{
    int l = 20, m = 30, i = 100;
    b = f2 (b, c, k) + 10;
    k = k * l - m * i;
    b = c++ + 5;
    k = l = m * i;
}
int main()
{
    int i = 10, j = 20, k = 30;
    char c = 'a', b = 'd', a = 'A';
    f1(c, b, i);
    cout << a << " " << b << " "<< i;
    cout <<" "<< c <<" "<< j <<" "<< k;
    cout << endl << a << endl;

    if (!i)
        cout << i;
    else
        cout << k;
    return 0;
}
```

WORKING

a = 105 = i

a = 106 = j

n = 10 + 5 = 15

Cout <<

f2's cout

a j + d

m 10 + 15

f2 return j

f1 b = 106 + 10 = 116 = t

k = 10 * 20 - 30 * 100

= 200 - 3000

= -2800

b = d (100) + 5 = 105 = i

K = l = 30 × 100 = 3000

Output

aj+d

m10+15

Aleave line

d 3000 t 20 30

c = d

Aleave Line

10

- Represents space
- Repeat

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Roll Number:_____ Section: _____

Question2. Implement the function `bool isSymmetric(int a[ ], int size, int idx)` that takes in as input an integer array, its size and an index number. The function first reverses all elements from index 0 to index `idx`. After reversing the elements, the function returns true if the array becomes symmetric and false otherwise. An array is symmetric if reading the numbers from left to right (start to end) or right to left (end to start) produces the same list. If the `idx` is out of bound, return false and do nothing. **[10 Points]**

Sample example 1

a	12	3	5	6	7	7	12	3	5	6
size	10	0	1	2	3					
idx	3									

Reverse elements from index 0 to 3 since `idx` = 3

a	6	5	3	12	7	7	12	3	5	6

The function returns true since the array is symmetric. Reading the number from right to left or left to right produces the same sequence [6 5 3 12 7 7 12 3 5 6]

Sample example 2

a	12	3	5	6	7	7	12	3	5	6
size	10									
idx	5									

Reverse elements from index 0 to 5 since `idx` = 5.

a	7	7	6	5	3	12	12	3	5	6

The function returns false since the array is not symmetric. Reading the number from left to right produces the sequence [7 7 6 5 3 12 12 3 5 6] whereas reading them from right to left produces the sequence [6 5 3 12 12 3 5 6 7 7].

Implement the function `isSymmetric`. You are **not allowed** to use another array for this problem.

Space for rough work

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Note: No need to write the main function

```
bool isSymmetric(int a[ ], int size, int idx)
{
    int temp;
    bool flag = true;
    for(int i=0, j=idx ; i<j ; i++, j--)
    {
        temp = a[i];
        a[i] = a[j];
        a[j] = temp;
    }
    for(int k=0, l=size-1 ; k<l ; k++, l--)
    {
        if(!(a[k] == a[l]))
        { flag=false;
          break;
        }
    }
    return flag;
}
```

9.5

what if idx > size-1?

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National University of Computer and Emerging Sciences, Lahore Campus

Course:	PF Lab	Course Code:	CL 1002
Program:	BS-DS, BS-SE	Semester:	Fall 2021
Duration:	2 Hours	Total Marks:	100
Date:	22-Jan-2022	Weight	40 %
Section:	BCS(1H,1J,1K,1L,1M,1N) BDS(1A)	Page(s):	
Exam:	Lab Final Term	Reg. No.	

Read below Instructions Carefully:

- Understanding the question statement is also part of the exam, so do not ask for any clarification. In case of any ambiguity, make suitable assumptions.
- You have to complete exam in 2 hrs. No extra time will be given for submission.
- For submission, submit all .cpp files (containing function and main) named as 21L-1122-Q1.cpp, 21L-1122-Q2.cpp, etc.
- Submission path: \\Cactus\Xeon\PF Final Exam Submissions\Your specific section
- Submit all questions .cpp file on Google Classroom under assignment titled as **PF- Lab Final term Submission. (Don't create zip file)**
- Your code should be intended and commented properly. Use meaningful variable names.
- It is your responsibility to save your code from being copied. All matching codes will be considered cheating cases. PLAGIARISM will result in forwarding of case to Disciplinary Committee and negative marks in Final term.

(Q-1) Encryption: 35 15 50 **[25 + 15 + 10 Points]**

Encryption is a classical method for protecting messages. Typical encryption schemes divide a given message into blocks and then encrypt each block using a pre-defined **method.**

One such **method** of encrypting a message block of size at most 25 works as follows.

The message is placed in a grid of 5 x 5 size **row wise** and then is read column wise to create the confidential message.

For example if we need to encrypt the message **"Protect this message well"** it is placed in a 5x5 grid as shown below (the character **.** specifies space here)

P	r	o	t	e
c	t	.	t	h
i	s	.	m	e
s	s	a	g	e
.	w	e	l	l

next read it column wise to create the encrypted message **"Pcis.rtsswo..aettmgleheel"**

To decrypt the message we just place the encrypted message block in the 5x5 grid column wise and read it row wise to get the decrypted/original message

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During encryption, if the message block has length smaller than 25 then the remaining grid is filled with special symbol **$.** So to encrypt the message **"Protect this message"** the grid looks as follows

P	r	o	t	e
c	t	.	t	h
i	s	.	m	e
s	s	a	g	e
$	$	$	$	$

And hence the encrypted message becomes **"Pcis$rtss$o..a$ttmg$ehee$** while this special symbol is ignored during decryption.

Part a) Write a C++ function that takes a character array containing a null terminated string **MessageBlock** (text block to be encrypted), and a second character array **Encrypted_Message** as parameters. It should encrypt and return the encrypted message to the calling function by using the Encrypted_Message array.

void Encrypt(char MessageBlock[], char Encrypted_Message[]);

Example(s): The following Table shows inputs and the corresponding outputs for three different test cases.

Message	Encrypted_Message
"middle-Outz"	**"mez$$i-$$$dO$$$lt$$$"**
"Always-see-the-right-Side"	**"As-r-l-siSwsegiaeehdye-te"**
"He is a friend indeed"	**"H.iideaen$..nd$ifde$sr.e$"**

Note: All test input will be a valid ASCII string.

Part b) Write a C++ function that takes an encrypted message block of size exactly 25 and return the decrypted message to the calling function. The proposed prototype of the function is

void Decrypt(char Encrypted_Message[], char Message[]);

Part c) Write a main function to test your encryption and decryption function. The main must ask the user to enter a message/string of length at most 25 and then display the original message, the encrypted message and the decrypted message on console.

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(Q-2) Balance Points: [35 + 15 Points]

A position **(i, j)** in a m x n 2D array A[][] of integers is said to be a balance point of the array if

A[i][0] + A[i][1] + ... + A[i][j-1] is equal to A[i][j+1]+A[i][j+2]+ ... + A[i][n]

AND

A[0][j] + A[1][j]+ ... + A[i-1][j] is equal to A[i+1][j] + A[i+2][j]+ ... + A[m][j]

For example the following 5 x 5 array has two balance points at positions (2, 2) and (3, 3)

1	0	1	-1	2
1	5	3	1	2
-1	9	3	3	7
12	5	2	7	19
10	20	2	3	15

Similarly the following 5 x 5 array has no balance point.

1	2	3	4	5
6	7	8	9	0
1	2	3	4	5
6	7	8	9	0
1	2	3	4	5

Part a) Write a C++ function that has a 5 x 5 array as an input parameter and return the count of balance points in that array. This function must also display each balance point on a new line.

If the first array given above is passed to the function then function must return a value 2 to the calling function and also display the following two lines

(2, 2)

(3, 3)

Part b) Write a main function that declares and inputs numbers in a 5 x 5 array of integers and then pass it to the function of part a to compute the total balance points in that array. The main function must display this information in a proper format on console

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