Ain Shams University
Faculty of Science
Department of Mathematics
Computer Science Division
Date: Saturday 10 June 2023
Total Marks: 90 Marks

Course: COMP 104 (برمجة حاسب1).
Level: 1
Semester: Spring 2022/2023
Program: حا - ب حا - س حا - ف حا
Time Allowed: 2 (Two) Hours.
Number of pages: 2

Question One [20 Marks]

a) [8 Marks] For the following C++ snippet (assuming all necessary libraries are included), print the output of the code.

```
int x=2, y=10, i=3;
for(; i>0; i--){
    x += y%++x;
    y *= pow(i,2);
    i--;
    std::cout<<i<<","<<x<<","<<y<<'\n';
}
```

b) [12 Marks] Write a program that reads a multiple-digit integer from the user. The program prints the count of the even and odd digits. For example, if the user enters 2023 then the program prints "*3 even digits and 1 odd digit*".

Question Two [25 Marks]

a) [9 Marks] Declare an enumeration in your program as

enum PRICE_CAT EGORY{CHEAP=1,MEDIUM=30,EXPENSIVE=100};

Write a program that asks the user to enter the price of a product which has to be a positive number. The program should print whether the product is cheap or medium or expensive based on whether the price falls within the categories defined in the enumeration type. For example, if the user enters 20, the program should print "*the product is cheap*". If the user enters 200, the program should print "*the product is expensive*".

b) [9 Marks] Write a C++ program that reads a series of integer numbers from the user and stops when the user enters a negative number. The program should alternate between adding and multiplying the results of the prior operations. For example, when the user enters 2, 6, 4, 7, 3, -1, the program computes 2+6 and the results (8) is multiplied by 4, and the results (32) is added to 7, and the results (39) is multiplied by 3 (117). So it would print 117, which is ((((2+6)*4)+7)*3). Another example, when the user enters 3, 4, 1, 10, -1, the programs prints 17, which is ((3+4)*1)+10.

do while

c) [4 Marks] Convert the following for loop into a while loop:

```
for (int i=1; i <= n; i++)
    cout << i*i << " ";
```

d) [3 Marks] What is the output of the following code:

```
int a=1, b=1, c=0, d=4;
cout << (d <5 || a == b && --a == c) << "\n"<< a;
```

t f 0

Question Three [16 + 9 Marks]

a) [16 Marks] Write C/C++ loop statement to calculate the following series for some given n:

1- $2^2 - 3^2 + 4^2 - 5^2 + \cdots \mp n^2$

2- $1! + 2! + \cdots + n!$

3- For some given x, $1 - \frac{1}{x^2} + \frac{1}{x^3} - \frac{1}{x^4} + \cdots \mp \frac{1}{x^n}$

4- For some given two integers x and y, where x<y, write C/C++ code to compute the average of integers between x and y that are divisible by n.

b) [9 Marks] What is the output from the following loop where the input x is 5 10 2 -3 1?

```
int x,i,j;
for(i=1;i<5;i++){
    cin>>x;
    if(x<0)break;
    for(j=x; j<x+2 ;j++)
        cout<<"i="<<i<<" , j="<<j<<", x="<<x<<endl;
}
```

Question Four [7 + 6 + 7 Marks]

a) [7 marks] Trace the following C++ code and conclude the output.

```
int A[2][3]={ 6, 12, 5, 15, 3, 9};
int sum=0;
for (int i=0;i<2;i++){
    for(int j=0;j<3;j++){
        if( (i+j)%2==0 && A[i][j]%3==0)
            sum+= A[i][j]
        else
            sum+= 2*A[i][j];
        cout<<"sum="<<sum<<endl;
    }
}
```

	0	1	2
0	6	12	5
1	15	3	9

0+0= 6
0+1= 1
0+2= 2
1+0= 1
1+1= 2
1+2= 3

b) [6 marks] define a C\C++ function $f(x,n)$:

$$f(x,n) = \sum_{i=1}^{n} \sqrt{x^2 + i^2} = \sqrt{x^2+1^2} + \sqrt{x^2+2^2} + \cdots + \sqrt{x^2+n^2}$$

c) [7 marks] define a C\C++ function with the name midRange. This function takes an array of integers and its length as input and calculates the midrange of these integers (the mean of the highest and lowest values, i.e., (Max + Min)/2).

بالنجاح والتوفيق

د/ محمد فخري الدين
د/ ضياء ابراهيم نصر
علوم الحاسب – قسم الرياضيات