

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=3, y=5, i=1;
do{
    x = y/x;  $\Rightarrow x=1$ 
    y *= i + pow(i++,2);  $= 2 + 2^2 = 4$ 
    std::cout<<i<<" "<<x<<" "<<y<<"\n";
} while (i<3);
```

- b) [12 Marks] A palindrome multiple-digit integer is an integer that reads exactly the same as from right-to-left or left-to-right. For example, 2023 is not palindrome while 1991 is. Write a program that reads a multiple-digit integer from the user and prints whether the number is palindrome.

Question Two [25 Marks]

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- a) [5 Marks] Write a program to compute the square root of 2 by repeatedly replacing one estimate x with the closer estimate $(x + 2/x)/2$, where the initial value of $x=2$. Note that this is simply the average of x and $2/x$.

- b) [4 Marks] Convert the following if statement into a switch statement:

```
if (x > 5 && x <= 8)
    cout << "within range";
else if (x == 4)
    cout << "exact";
else
    cout << "done".
```

- c) [4 Marks] What is the output of the following code:

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

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Question Three [25 Marks]

- a) [15 Marks] Write a C++ program that reads an array of n integers. Then
- [1] print out positions of integers that are divisible by 3
 - [2] calculate the average of integers that are divisible by 3
 - [3] find out the maximum and minimum and the difference between them.
- b) [10 Marks] Write a C++ program that reads an array consisting of student test scores in the range 0 to 100. It must then determine the number of students who have scores in each of the following ranges: 0–24, 25–49, 50–74, 75–100. Shows the score ranges and the number of students in each range.

Question Four [20 Marks]

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

```
int A[3][3]={ 6, 2, 5, 15, 3, 9, 8, 10, 24};
int sum=0;
for (int i=0;i<3;i++){
    for(int j=0;j<3;j++){
        if( i==j && A[i][j]%2 ==0 )
            sum+= A[i][j]+ A[i][2-j];
        else
            sum-= A[i][j];
        cout<<"sum="<<sum<<endl;
    }
}
```

- b) [5 marks] Write the C/C++ function definition to declare the following function:

$$f(x,y) = \begin{cases} x^2 + y^2 & \text{if } x \geq y \\ xy & \text{if } x < y \end{cases}$$

- c) [8 marks] Write a C/C++ code that contains:

- 1- Function "testPrime(x)" that verifies if the integer x is prime or not
- 2- Function displayPrime(A,n) that shows all the prime numbers in the integer array A of length n .

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بالجراح والتوفيق