CS2311 2022-23 Sem A
Midterm

Question 1 [36 marks]

Write the console output of the following programs.

A.

```
int a = 10;
double b = 10;
cout << 25/a << ' ' << 25/b;
```

ANS:
2 2.5

B.

```
char x = 'a';
cout << x++ << ' ' << ++x;
```

ANS:
a c

C.

```
int func(int a, int b) {
    cout << a + b << ' ';
    return a - b;
}

int main() {
    int a = 2, b = 2;
    if (func(a, b) && func(a+2, b))
        cout << 'A';
    else
        cout << 'B';
   return 0;
}
```

ANS:
4 B

D.

```
int func(char c) {
    int i;
    switch (c) {
        case 'x': i = 1; break;
        case 'y': i = 2; break;
        case 'z': i = 3; break;
        default:  i = 4;
     }
     return i;
}

int main() {
     cout << func('y') + func('a');
     return 0;
}
```

ANS:
6

E.

```
int a[6] = {2, 5, 6, 7, 9, 8};
for (int i = 0; i < 6; i++) {
    if (a[i]%2 == 0)
        continue;
    else if (a[i]%3  == 0)
        break;
    else
        cout << a[i] << ' ';
}
```

ANS:
5 7

F.

```
int a[2][4] = {{1,2,3}, {4}};
cout << a[0][1] << ' ' << a[0][3] << ' ' << a[1][2];
```

ANS:
2 0 0

Question 2 [24 marks]

The following program tries to sort an integer array into ascending order using bubble sort. The array size is defined as N = 6. This program has both syntax errors and bugs. Please correct them. Marks will be deducted for incorrect answers.

Ln	Code with Syntax Errors and Bugs	Corrected Code (ANS)
1	#include <iostream>	
2	using namespace std;	
3	#define N 6	
4	int main() {	
5	int a[N] = {6,3,2,5,4,1};	
6	for (i = 0; i < N-1; i++) {	for (int i = 0; i < N-1; i++) {
7	bool sorted = false;	bool sorted = true;
8	for (j = N-1; j > i; j++) {	for (int j = N-1; j > i; j++) {
9	if (a[j-1] > a[j]) {	
10	int tmp = a[j];	int tmp = a[j];
11	a[j-1] = a[j];	a[j] = a[j-1];
12	a[j] = tmp;	a[j-1] = tmp;
13	sorted = true;	sorted = false;
14	}	
15	}	
16	if (sorted = true)	if (sorted == true) // if (sorted) is also correct
17	break;	
18	}	
19	return 0;	
20	}	

Question 3 [20 marks]

The Fibonacci numbers, commonly denoted as F(n), form a sequence, called the Fibonacci sequence, such that each number is the sum of the two preceding ones, starting from 0 and 1. That is,

F(0) = 0, F(1) = 1
F(n) = F(n – 1) + F(n – 2), for n > 1

Write a function and name it as fibonacci to calculate F(n) for a given n, where 0 <= n <= 30. Below is a program that calculates the Fibonacci of an integer number entered by the user.

```
#include <iostream>
using namespace std;
int fibonacci(int n);
int main() {
        int n;
        cout << "Please input an integer number \n";
        cin >> n;
        cout << "The fibonacci number of " << n << " is: \n";
        cout << fibonacci(n);
        return 0;
}
```

With a correct implementation of fibonacci, the example Input/Output of this program should be:

Example 1:

```
Please enter an integer number:
3
The fibonacci number of 3 is:
2
```

Explanation: F(3) = F(2) + F(1) = F(1) + F(0) + F(1) = 1 + 0 + 1 = 2

Example 2:

```
Please enter an integer number:
4
The fibonacci number of 4 is:
3
```

Explanation: F(4) = F(3) + F(2) = F(3) + F(1) + F(0) = 2 + 1 + 0 = 3

Please implement int fibonacci(int n) below.

ANS:

```
int fibonacci(int n)
{
	if (n == 1)
		return 1;
	else if (n == 0)
		return 0;
	else
		return fibonacci(n-1) + fibonacci(n-2);
}

// NOTE: correct non-recursive implementation also gets full marks
```

Question 4 [20 marks]

Write a function to remove redundant numbers in an integer array. The function prototype is given below,

int removeRedundant(int a[], int n);

where a[] is the input array, and n is the number of elements in a[]. The returned value is the number of elements in a[] after removing all redundant numbers.

Below is a program that calls removeRedundant to process an integer array entered by the user.

```
#include <iostream>
using namespace std;
#define N 10
int removeRedundant(int a[], int n);
int main() {
        int a[N], i;
        cout << "Please enter 10 integer numbers: \n";
        for (i = 0; i < N; i++)
                cin >> a[i];
        int new_size = removeRedundant(a, N);
        cout << "After removing redundant numbers: \n";
        for (i = 0; i < new_size; i++)
                cout << a[i] << ' ';
        return 0;
}
```

With a correct implementation of removeReundant, the example Input/Output of this program should be:

Example 1:

```
Please enter 10 integer numbers:
2 3 9 10 2 8 9 10 7 1
After removing redundant numbers:
2 3 9 10 8 7 1
```

Example 2:

```
Please enter 10 integer numbers:
1 2 3 4 4 4 3 2 1 0
After removing redundant numbers:
1 2 3 4 0
```

Please implement int removeRedundant(int a[], int n) below.

ANS:

```
int remvoeRedundant(int a[], int n)
{
	int i, j;
	i = 0;
	while (i < n) {
		for (j = 0; j < i; j++) {
			if (a[i] == a[j])
				break;
		}
		if (j != i) {
			for (j = i; j < n-1; j++)
				a[j] = a[j+1];
			n--;
		} else {
			i++;
		}
	}
	return n;
}
```