UNIVERSITY OF THE PUNJAB

B.S. 4 Years Program / Second Semester – Spring 2022

Roll No. 064455

Course Code: CC-112

Time: 3 Hrs.   Marks: 60

Paper: Programming Fundamentals

THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1. Answer the following short questions: (6+8+6+10=30)

1. [6 marks] Consider the following code.

```cpp
#include <iostream>
using namespace std;
int main()
{
        int x = 4; int num = 0;
        while (x <= 18)
        {
                x *= 2;
                printf("%d ,", x);
                if ((num++) % 2 == 1) continue;
                printf("%d ,", x);
                printf("%d ,", num);

        }
        return 0;
}
```

2. [4x2=8 marks] Consider the following code and memory map showing memory locations and address at the bottom of each memory cell.

```cpp
#include <iostream>
using namespace std;
int main()
{
        int* p; int x = 7;
        p = &x;
        return 0;
}
```

Memory map for p:
- 1st row: value or contents of memory location,
- 2nd row: address of memory location

00AFF88C
00AFF8C8

Memory map for x:
- 1st row: value or contents of memory location,
- 2nd row: address of memory location

7

00AFF88C

What will be the output of the following lines of code? You are required to use the same memory addresses as shown in the map above otherwise ZERO will be granted.

```
a) printf( "p: %p \n", p);
b) printf("*p:%d \n", *p);
c) printf("&p:%p \n", &p);
d) printf("&x:%p \n", &x);
```

3. [3x2=6 marks] Consider the following code and memory map showing memory locations and address at the bottom of each memory cell.

```
#include <iostream>
using namespace std;
int main()
{
        int arr[4] = { 1,2,3,4 };
        int* p;
        p = arr;
        return 0;
}
```

Memory map for arr:
1st row: value or contents of memory location,
2nd row: address of memory location

1	2	3	4
008FF9F4	008FF9F8	008FF9FC	008FFA00

Memory map for p:
1st row: value or contents of memory location,
2nd row: address of memory location

008FF9F4	1
008FF9E8	

In continuation to the previous code, what will be the output of the following statements? You are required to use the same memory addresses as shown in map above otherwise ZERO will be granted.

```
a) printf( "p: %p\n" , p);
b) printf( "*p: %d\n" ,*p);
c) printf( "&p: %p\n" , &p);
```

4. [10 marks] Declare and define a one dimensional dynamic array of integers A of size as mentioned by the user during input. Then declare a dynamic array of pointers B of same size as A. Make the cells of array B point to the respective cells of array A. That is, B[0] points to the memory location represented by A[0], B[1] points at A[1] and so on.

Q.2. Answer the following questions: (3x10=30)

[10 marks] Part A

You are provided with file "dictionary.txt" consisting of a paragraph of text in English. Read the file and do the following tasks:

1. Count no of words that have two A or a in them
2. Count statistics for all alphabets i.e. how many words starting with AA, BB, CC,...,ZZ. Words may start from small letters as well, count both of them together. At the end display count of all and sum total

P.T.O.

[10 marks] Part B
Print the following pattern using at least two nested loops, otherwise ZERO will be granted.

```
1       2       3
2       4       6
3       6       9
••••••••••••••••

2       3       4
4       6       8
6       9       12
••••••••••••••••

3       4       5
6       8       10
9       12      15
••••••••••••••••
```

[10 marks] Part C

Consider the following algorithm to generate a sequence of numbers. Start with an integer n. If n is even, divide by 2. If n is odd, multiply by 3 and add 1. Repeat this process with the new value of n, terminating when n = 1. For example, the following sequence of numbers will be generated for n = 22:

22 11 34 17 52 26 13 40 20 10 5 16 8 4 2 1

For an input n, the cycle-length of n is the number of numbers generated up to and including the 1. In the example above, the cycle length of 22 is 16. Given any two numbers i and j, you are to determine the maximum cycle length over all numbers between i and j, including both endpoints.
Input:
The input will consist of a series of pairs of integers i and j, one pair of integers per line. All integers will be less than 1,000,000 and greater than 0.
Output:

For each pair of input integers i and j, output i, j in the same order in which they appeared in the input and then the maximum cycle length for integers between and including i and j. These three numbers should be separated by one space, with all three numbers on one line and with one line of output for each line of input.
Sample Input:
1 10
100 200
201 210
900 1000
Sample Output
1 10 20
100 200 125
201 210 89
900 1000 174

THE ANSWERS MUST BE ATTEMPTED ON THE ANSWER SHEET PROVIDED

Q.1.   Answer the following short questions: (5x6=30)

1) What is numeric overflow?

2) What happens in a while loop if the control condition is true initially?

3) What does the term "passing a parameter by value" mean in the context of a function?

4) Write the output produced by the following program.

```
bool x = false, y = true;
y = x || !y;
y = !x && !y || x && y;
x = !(x || y) && (x && y);
cout << x << "\t" << y << endl;
```

5) Write the output produced by the following program.

```
for (int i = 0; i < 6; i++)
    if (i % 2 == 0)
        cout << i * i << "\t";
    else if (i % 3 == 0)
        cout << i + 1 << "\t";
    else if (i % 5 == 0)
        cout << 2 * i - 2 << "\t";
    else
        cout << i << "\t";
```

Q.2.   Answer the following questions: (3x10=30)

1) Write a program that calculates a car's gas mileage. The program should ask the user to enter the number of gallons of gas the car can hold, and the number of miles it can be driven on a full tank. It should then display the number of miles that may be driven per gallon of gas.

2) Write a program that prompts the user to input a number between 1 and 10 (inclusive). The program should use a switch statement to display the corresponding Roman numeral for the entered number. If the user enters a number outside the specified range (less than 1 or greater than 10), the program should display an error message and prompt the user again for a valid input.

3) Write a program that prompts the user to enter the length of a number and the number itself. The program should then calculate and display the sum of all the digits in that number. The length of the number should be entered before entering the actual number.