**NATIONAL UNIVERSITY OF COMPUTER & EMERGING SCIENCES**

**ISLAMABAD CAMPUS**

**CS217 Object Oriented Programming- Fall 2020**

**ASSIGNMENT- 2**

**Section (A, B, C, D, and F)**

**Due Date: Sunday 1st November 2020 at 11:59 pm on Google Classroom**

**Instructions:**

1. Assignments are to be done individually. You must complete this assignment by yourself. You cannot work with anyone else in the class or with someone outside of the class. The code you write must be your own and you must understand each part of coding. You are encouraged to seek help from the instructors through email, on google classroom or individually visiting their respective offices.

2. The AIM of this assignment is to practice with Recursion and Structures in C++.

3. No late assignments will be accepted.

4. Displayed output should be well mannered and well presented. Use appropriate comments and indentation in your source code.

5. Plagiarism:

Plagiarism of any kind (copying from others and copying from internet, etc.,) is not allowed. If found plagiarized, you will be awarded zero marks in the assignment. Repeating such an act can lead to strict disciplinary actions and failure in course.

**Submission Guidelines:**

We will be using auto-grading tools, so failure to submit according to the following format would result in zero marks in the relevant evaluation instrument:

i) For each question in your assignment, make a separate .cpp file e.g. for question 1, make q1.cpp and so on. Each file that you submit must contain your name, student-id, and assignment # on top of the file in the comments.

ii) Combine all your work in one folder. The folder must contain only .cpp files (no binaries, no exe files etc.,).

iii) Run and test your program on a lab machine before submission.

iv) Rename the folder as ROLL-NUM\_SECTION (e.g. 19i-0001\_B) and compress the folder as a zip file. (e.g. 19i-0001\_B.zip).

v) Submit the .zip file on Google Classroom within the deadline.

vi) Submission other than Google Classroom (e.g. email etc.) will not be accepted.

vii) The student is solely responsible to check the final zip files for issues like corrupt file, virus in the file, mistakenly exe sent. If we cannot download the file from Google classroom due to any reason, it will lead to zero marks in the assignment.

**Questions: Total Points: 100**

Q (1) Write functions for each of the following problems. Each problem should be solved by writing a recursive function. Your final program should not have any loops in it.

1. Write a function that uses recursion to raise a number to a power. The function should take two arguments, the number to be raised to the power (floating point) and the power (a non-negative int). (10 Points)
2. Write a boolean function named **isMember** that takes two arguments: an array of type char and a value. It should return true if the value is found in the array, or false if the value is not found in the array. (10 Points)
3. A palindrome is any word, phrase, or sentence that reads the same forwards or backwards. Here are some palindromes:

Level

Civic

Pot top

A man a plan a canal Panama

Write a boolean function that determines if a string argument is a palindrome. The function should return true if the argument reads the same forwards and backwards. Your function should ignore spaces and be case-insensitive. Assume the input is just letters and spaces. (20 Points)

Q (2) A phone number, such as (212) 767-8900, can be thought of as having three parts: the area code (212), the exchange (767), and the number (8900). Write a program that uses a structure to store these three parts of a phone number separately. Call the structure phone. Create two structure variables of type phone. Initialize one, and have the user input a number for the other one. Then display both numbers. (10 Points)

The interchange might look like this:

Enter your area code, exchange, and number: 415 555 1212

My number is (212) 767-8900

Your number is (415) 555-1212

Q (3) A point on the two-dimensional plane can be represented by two numbers: an x coordinate and a y coordinate. For example, (4,5) represents a point 4 units to the right of the vertical axis, and 5 units up from the horizontal axis. The sum of two points can be defined as a new point whose x coordinate is the sum of the x coordinates of the two points, and whose y coordinate is the sum of the y coordinates. Write a program that uses a structure called point to model a point. Define three points, and have the user input values to two of them. Then set the third point equal to the sum of the other two, and display the value of the new point. (10 Points)

Interaction with the program might look like this:

Enter coordinates for p1: 3 4

Enter coordinates for p2: 5 7

Coordinates of p1+p2 are: 8, 11

Q (4) Create a structure called time. Its three members, all type int, should be called hours, minutes, and seconds. Write a program that prompts the user to enter a time value in hours, minutes, and seconds. This should be in 12:59:59 format. This entire input should be assigned first to a string variable. Then the string should be tokenized thereby assigning the 1st token to hours, 2nd token to minutes, and 3rd token to seconds member variables of the structure called time. Finally inside a void Print\_in\_Seconds(void) member function of time structure, it should print out the total number of seconds represented by this time value:

long totalsecs = t1.hours\*3600 + t1.minutes\*60 + t1.seconds (10 Points)

Q (5) Suppose you have been given the task to design a text editor which will take any multiline text from user and then display the statistics like total number of characters i.e., characters\_count (excluding the white space and punctuations), words\_count, and redundant\_words\_count. Create a structure named Text\_Editor having four type members namely **inserted\_text** (of type string), **characters\_count** (of type unsigned int), **words\_count** (of type unsigned int), and **redundant\_words\_count** (of type unsigned int). The structure should also have **member functions** namely **Insert\_Text( )** for obtaining the multiline text from user and assigning to input\_text member-variable. End of text insertion should be specified by ‘**#**’ character. Moreover, there should be a separate member-function of the created structure named **Count\_Ch( ), Count\_Words( ),** and **Count\_Redundant\_Words( )** that should process the input text in order to calculate and print the relevant statistics. All these different tasks are to be implemented using recursion technique. (30 Points)