Issue Date: September 2, 2021 Due date: September 5, 2021

Instructions:

- Plagiarism is defined as "taking and using the thoughts, writings, and inventions of another person as one's own". IBA has no compromise policy on Plagiarism – in case, plagiarism proved student will be given **F grade**.
- Your assignment should represent your own effort. However, you are not expected to work alone. It is fine to discuss the exercises and try to find solutions together, but each student shall write down and submit his/her solutions separately. It is good academic standard to acknowledge collaborators, so if you worked together with other students, please list their names.
- Electronic Submission on LMS is compulsory.
- Assignment will be graded on the basis of **timely submission on LMS**.

Deliverables:

For each question, submit the code and word file for descriptive questions.

Question 1. Do the following.

Suppose an array Arr is stored in a memory whose starting address is 348. Assume that int[] Arr={-98, -97, -96, …, 128, 129, 130}, the cell size is depends on the data type, here the data type is int therefore each cell occupied **4 bytes**. The values stored in Arr in sequence from -98 to 130 then obtain the following:

a. How many elements are there in the array Arr?

b. How much memory is required to store the entire array?

c. What is the location address for Arr[70]?

d. What is the location address of 10^{th} element in an array?

e. Which element is located at 828?

Question 2. Implement the following basic operations of the generic dynamic array and determine big-Oh of each method.

1. boolean isEmpty(); // return true if array is empty;
2. int length(); //returns the number of occupied cells in the list, which is 0 for the empty list;
3. void print(); // print the content occupied cells;
4. void addAtFront(T value); //add new data to the beginning of the list;
5. void addAtEnd(T value); //add new data in the end of the list;
6. int find(T value) returns index number of the value;
7. void reverse() reverses the list;
8. void removeFirst(T value) removes the first occurrence of the value in list by backward movement;
9. void removeAll(T value) removes all occurrence of value in the list by backward movement
10. create dynamic array of user-defined type and place the object in sorted order. You have to implement a comparable interface and override the compareTo() method in your class. For example, create a class student with class member variable (name, id, age) and place each object of student in dynamic array sorted by their ages. See ppt slides for help.

Question 3. Implement the following operations recursively and determine the time-complexity and space complexity of each method.

1. int FindMax (int[] arr, int ind); // return max value stored in an array; draw recursive call trace for array of size 4.
2. int power (int b, int p); //Compute powers using recursive implementation where base and power are provided as input. Also draw recursive calls.
3. Void tower (int n, char s, char des, char t); // solve tower of Hanoi recursively and answer the following questions
    a. How many recursive calls are made in tower of Hanoi function, when n =3.
    b. How many recursive calls are made in tower of Hanoi function, when n =20.
    c. At most at one time how many frames are created in stack during recursive calls of tower of Hanoi method when n=4.