Assignment No 1

Important Note:

- For all the questions, you have to use Visual Studio and upload all of the files of the solution. All questions should be done on a Console based application.
- Create separate solutions files for each question
- Every Question should be named as "k<Year><StudentID>_<QuestionNumber> for instance: k060195_Q1
- Your Assignment should have proper Objected Oriented Programming and Data Structures
- Last Date for Submission: **February 19, 2019 (11:55 PM)**

Q1: Data Type Selection

An Internet Service Provider (ISP) has divided the Karachi city into 16 zones. Every hour they intend to check if the zones are using their full capacity or not. You have been assigned to write the code for the centralized server of Karachi which will identify which zones needs additional bandwidth allocation. All individual zones are sending their status every hour.

Your task is to write a code which reads the input available in a file and can store the statuses of each of the zones by using least possible memory.

Note: An input file named "Q1Input.txt" will contain statuses of each zone in the following format:

Z1,1
Z2,0
.
.
.
Z24,1

Note: 1 means using complete allocated bandwidth,
0 means can handle more users

Q2: Create a custom class called DynamicIntArray that implements a dynamic array of integers.

a) Keep a data member to store the current size of the array
b) Keep a data member to store the current capacity of the array
c) Keep a data member to store the actual array.
d) Provide a default (no argument) constructor that sets the current capacity to 10 and allocates memory for a ten-element array of integers.
e) Provide another constructor that takes one argument to specify the initial capacity of array.

f) Provide a method "void Add(int)" that appends an element to the end of the array. If the current size of the array reaches the capacity of the array, more memory is allocated to extend the capacity of the array.
g) Provide a method "int Get(int)" that returns the element value of the index specified by the argument.
h) Provide a method "int IndexOf(int)" that finds the element value specified by the argument and returns the index where it is found, or -1 if it is not found.
i) Make sure your class cannot be further inherited by any other class.

Q3: Write a program that compares the performance of the above Dynamic Array with C# array, ArrayList and List<int>.

a) Populate the collections by generating 1M (one million) random values
b) Carry out traversal and find the sum of the element values. Print the sum and the time required to carry out the traversal in each case.
c) Search five randomly chosen values from each of the collection by calling the IndexOf() function and compare response times.

Q4: Convert your DynamicIntArray class to a template / generic DynamicArray<T> class that can be an array of any type.

Q5: Implement the IList<T> interface to the class DynamicArray by providing the implementation of the necessary methods.

Q6: Compare performance of DynamicArray<T> with List<T> and C# array for data types:

a) String
b) Decimal
c) Boolean

Rules for Marking:

It should be clear that your assignment will not get any credit if:

- The Assignment is submitted after due date.
- The Submitted Assignment does not open or file is corrupted
- No assignment will be accepted through email unless slate is not working at the submission deadline.
- Copied amongst students or from another source