Assignment 2

CS221: Data Structures and Algorithms

Usman Institute of Technology

Fall 2018

Release Date: 7 November, 2018

Submission Mode: Soft-copy

- How to submit:
  - Create an account on http://www.turnitin.com/ as a Student
  - Use following information at time of sign-up
    - Class ID: 19412335
    - Enrollment Key: CS211FALL18
  - You can submit your assignment by **15 November 2018 11:59 pm.**
- Make sure that function names must be similar as asked in the assignment.
- **YOU HAVE TO SUBMIT ONLY ONE .CS FILE**
- **YOUR FILE NAME MUST BE IN THE FORMAT OF <YOUR ROLL NUMBER>.CS**
  - **For example, if you Roll Number is 15B-121-BS then your file name must be 15B-121-BS.cs**
- You must read Academic Integrity at the end of this document.
  - If more than one of your assignments found plagiarized then all marks of assignment will be marked Zero (0).

Double Ended Queue (or Deque)

Deque or Double Ended Queue is a generalized version of Queue data structure that allows insert and delete at both ends.

Operations on Deque:

Mainly the following four basic operations are performed on queue:

insertFront(): Adds an item at the front of Deque.
insertLast(): Adds an item at the rear of Deque.
deleteFront(): Deletes an item from front of Deque.
deleteLast(): Deletes an item from rear of Deque.

In addition to above operations, following operations are also supported

getFront(): Gets the front item from queue.
getRear(): Gets the last item from queue.
isEmpty(): Checks whether Deque is empty or not.
isFull(): Checks whether Deque is full or not.

You have to perform following tasks for your assignment.

1. **[40 Marks]** Create a class ArrayDeque for integer data and implement the operations discussed above.

2. **[20 Marks]** Create a function add(i,x) to insert an element x at i^{th} position of the queue. We check if i < n/2, we shift the element a[0] , …, a[i-1] left by one position. Otherwise, we shift the elements a[i], … , a[i-1] right by one position. The running time of add(i,x) operation should not exceed O(1+min{i, n-i}). (Hint: see the book "Open Data Structure")

   void add(int i,int x)

3. **[20 Marks]** Create a function remove() in order to remove an element from the i^{th} location of the queue. It either shifts elements a[0], …, a[i-1] right by one position or shifts the elements a[i + 1], …, a[n-1] left by one position depending on whether i < n=2. Again, this means that remove(i) never spends more than O(1+min{i, n-i}) time to shift elements. (Hint: see the book "Open Data Structure")

   int remove(i)

4. **[20 Marks]** Implement a method rotate(r) that "rotates" a List so that list item i becomes list item (i + r) mod n.

   void roate(r)

Academic Integrity

Each student in this course is expected to make sure that any work submitted by a student in this course for academic credit will be the **student's own work**. Scholastic dishonesty shall be considered a serious violation of these rules and regulations and is subject to strict disciplinary action. Scholastic dishonesty includes, but is not limited to, cheating on exams, plagiarism on assignments, and collusion.

PLAGIARISM: Plagiarism is the act of taking the work created by another person or entity and presenting it as one's own for the purpose of personal gain or of obtaining academic credit. Plagiarism includes the submission of or incorporation of the work of others without acknowledging its provenance or giving due credit according to established academic practices. This includes the submission of material that has been appropriated, bought, received as a gift, downloaded, or obtained by any other means. Students must not, unless they have been granted permission from all faculty members concerned, submit the same assignment or project for academic credit for different courses.

CHEATING: The term cheating shall refer to the use of or obtaining of unauthorized information in order to obtain personal benefit or academic credit.

COLLUSION: Collusion is the act of providing unauthorized assistance to one or more person or of not taking the appropriate precautions against doing so. Any student caught violating academic integrity will suffer an academic penalty. All violations of academic integrity will also be immediately reported to the Disciplinary Committee. Any student violating academic integrity a second time in this course will receive a failing grade for the course, and additional disciplinary sanctions may be administered through the Disciplinary Committee.

Conclusively, each student need to be take care of:

1. You must not share your solutions with other students. You are encouraged to discuss the problems but each student is supposed to take care of his or her own solution.
2. You must not submit solution of other students as yours.
3. You must duly cite all resources you used in development of your solution.
4. **If more than one of your assignments found plagiarized then all marks of assignment will be marked Zero (0).**