National University of Computer and Emerging Sciences

School of Computing Fall 2021 Islamabad Campus

CS-2001: Data Structures (Fall 2021)

Assignment 2

(Deadline: 25th October, 2021 11:59 PM)

Submission: Combine all your work (solution folder) in one .zip file. Use proper naming convention for your submission file. Name the .zip file as COURSE_ROLL-NUM_01.zip (e.g. DS_19i0412_01.zip). Submit .zip file on Google Classroom within the deadline. Submissions on the email will not be accepted.

Plagiarism: Plagiarism cases will be dealt with strictly. If found plagiarized, both the involved parties will be awarded zero marks in this assignment. Copying from the Internet is the easiest way to get caught!

Deadline: The deadline to submit the assignment is 25th October, 2021 at 11:59 PM. Correct and timely submission of the assignment is the responsibility of every student.

Comments: Comment your code properly. Write your name and roll number (as a block comment) at the beginning of the solution to each problem.

Templates: Your code must include templates.

LINKED LIST AND QUEUES 100 marks

Implementation of Citizens Database System in C++

Develop a Database of Citizens for the Country. The System consists of following parts:

1. Citizens Basic Information Database (CBID).
2. Citizens Criminal Information Database (CCID).

Citizens Basic Information Database (CBID):

CBID is the centralized system which means CCID would be connected to it. Each record would be identified by CNIC in CBID, then further linked to related CCID record. CBID record contains following information of each citizen.

i. CNIC (4-digit unique number)

ii. Name

iii. Father Name

iv. Gender

v. Address

vi. Nationality

CBID must have following features:

i. Data Structure must be strongly connected that is, each node contains the **address of its next node as well as previous node.**

ii. List must be maintained in Ascending order based on CNIC upon new Record entry.

iii. Locating and Updating Record must be based on CNIC.

Citizens Criminal Information Database (CCID):

CCID is to keep Citizens criminal record. Each record contains following information of each citizen.

i. CNIC (4-digit unique number)

ii. Crimes

   a. Details of each Crime.

   b. Punishment

   c. Fine

CCID must have following features:

i. Data Structure must be strongly connected that is, each node has the **address of the next node and the previous node and the last node can access head of the list**.

ii. List must be maintained in Ascending order based on CNIC upon new Record entry.

iii. Locating and Updating Record must be based on CNIC.

iv. "Crimes" is a **Singly Linked List**, each Node of a List contains all the information related to that Crime/Case.

v. As, CBID is the centralized Database; So, Node in CBID and CCID having same CNIC must have a two-way relationship i.e. If pointer is at some Node in CBID and wants to access criminal record of that person, it should be able to directly access that Node in CCID without the need of searching the whole Criminal Database to locate and see criminal record against concerned CNIC and vice-versa.

General Functionalities to Include:

All following functionalities will be implemented in the **Database** class.

i. Database Initialization: Upon running the program, it should read data for each Database from related Data Files and store it in a **Singly Linked-List-Based-Queue following FIFO rule –** This queue class is named **Datapipeline** and a skeleton for it is provided in the CitizensDatabase.h file**.** After loading all data into the Datapipeline Queue, program should start populating each Database (CBID and CCID) with related Queue Data following First-In-First-Out Rule i.e. FIFO.

ii. Search person by CNIC in CBID and display all Record from CBID and CCID

iii. Search person by CNIC in CCID and display all Record from CBID and CCID

iv. Search person by CNIC and display all Record from CBID and CCID

v. Update record in CBID i.e. Getter and Setter functions for: Name, F. Name, Address, Nationality.

vi. Add new crime and related data into Crimes-List of CCID.

vii. Delete crime from Crimes-List of CCID.

viii. Update Crimes-List record data i.e. Details, Charges, Punishment, Fine. Identify it on CNIC and

Crime.

Good Luck!