King Saud University

College of Computer and Information Sciences

Department of Computer Science

Data Structures (CSC212)

First Semester 2023

Course Project

10 Marks

Due Date: Phase 1 (14/10/2023 11:59pm)

The goal of this programming assignment is to provide you with hands on experience with handling data structures. You will use Java programming language to implement and use the requested data structure. This assignment is to be completed in groups of up to 3 people.

Project Title: Linked List Phonebook

Project Description: In this project, you will create a phonebook application that stores contact information using a linked list data structure. The application will allow users to add, search, and delete contacts from the phonebook. You will need to implement advanced search functionality that allows users to search for contacts based on multiple criteria (e.g., name, phone number, email address). Additionally, you need to be able to schedule events and appointments with contacts.

Classes to be implemented:

1. Contact: This class will represent a single contact in the phonebook. It should have fields for the contact's name, phone number, email address, address, birthday, and notes.
2. LinkedList ADT: This class will represent the linked list data structure used to store the contacts. It should have methods for adding, searching, and deleting contacts from the list.
3. Phonebook: This class will represent the phonebook application itself. It should have a field for the linked list ADT that stores the contacts and methods for interacting with the list (e.g., adding, searching, and deleting contacts). You will also need to schedule events and appointments with contacts.
4. Event: This class will represent events or appointment that can be scheduled with a contact. It should have fields for the event title, date and time, location, and the contact involved in this event.

Project Requirements:

- The Contact class should implement the Comparable interface so that contacts can be sorted by name when added to the linked list.
- The Phonebook class should provide a user-friendly interface for interacting with the phonebook (e.g., through a command-line menu or graphical user interface).
- Each contact in the phonebook should be unique. You can ensure this by checking if a contact with the same name or phone number already exists in the list before adding a new contact.

- When you search for a contact by email address, address, or birthday, you should return all contacts that have these values
- The Phonebook class should have methods for printing all contacts that share an event as well as all contacts that share the first name.
- In the event class, use any data structure you choose to store the events. You might have to include the event class object in another class. This problem is for you to solve.
- the search for an event is based on the event title or contact name.
- When a contact is deleted all events with that contact are also deleted.
- Make sure before adding an event that the contact in the event exist in the contact list.
- Write a method that will list all events available ordered alphabetically by event name in O(n) time.
- There should be no conflict in event scheduling. A new event should not be scheduled for a contact if it has a conflict with a current scheduled event.

Here's an example of what the input/output of the project might look like when run from the command line:

```
Welcome to the Linked Tree Phonebook!
Please choose an option:
1. Add a contact
2. Search for a contact
3. Delete a contact
4. Schedule an event
5. Print event details
6. Print contacts by first name
7. Print all events alphabetically
8. Exit

Enter your choice: 1

Enter the contact's name: Ahmad Al-Saud
Enter the contact's phone number: 0551234567
Enter the contact's email address: ahmad.alsaud@example.com
Enter the contact's address: 123 King Fahd Road, Riyadh
Enter the contact's birthday: 01/01/1980
Enter any notes for the contact: Friend from college

Please choose an option:
1. Add a contact
2. Search for a contact
3. Delete a contact
4. Schedule an event
5. Print event details
6. Print contacts by first name
7. Print all events alphabetically
8. Exit

Enter your choice: 1
Enter the contact's name: Ahmad Alzaid
Enter the contact's phone number: 0553211234
Enter the contact's email address: ahmad.zaid@example.com
Enter the contact's address: 123 King Faisal Road, Riyadh
Enter the contact's birthday: 01/01/1989
Enter any notes for the contact: Friend from work


Contact added successfully!

Please choose an option:
1. Add a contact
2. Search for a contact
3. Delete a contact
4. Schedule an event
5. Print event details
6. Print contacts by first name
7. Print all events alphabetically
8. Exit
Enter your choice: 2

Enter search criteria:
1. Name
2. Phone Number
3. Email Address
4. Address
5. Birthday

Enter your choice: 1

Enter the contact's name: Ahmad Al-Saud

Contact found!
Name: Ahmad Al-Saud
Phone Number: 0551234567
Email Address: ahmad.alsaud@example.com
Address: 123 King Fahd Road, Riyadh
Birthday: 01/01/1980
Notes: Friend from college

Please choose an option:
1. Add a contact
2. Search for a contact
3. Delete a contact
4. Schedule an event
5. Print event details
6. Print contacts by first name
7. Print all events alphabetically
8. Exit

Enter your choice: 4
Enter event title: Lunch with Ahmad
Enter contact name: Ahmad Al-Saud
Enter event date and time (MM/DD/YYYY HH:MM): 08/24/2023 12:30
Enter event location: Al-Nakheel Restaurant, Riyadh

Event scheduled successfully!

Please choose an option:
1. Add a contact
2. Search for a contact
3. Delete a contact
4. Schedule an event
5. Print event details
6. Print contacts by first name
7. Print all events alphabetically
8. Exit

Enter your choice: 5

Enter search criteria:
1. contact name
2. Event tittle

Enter your choice: 2

Enter the event title: Lunch with Ahmad

Event found!
Event title: Lunch with Ahmad
Contact name: Ahmad Al-Saud
Event date and time (MM/DD/YYYY HH:MM): 08/24/2023 12:30
Event location: Al-Nakheel Restaurant, Riyadh

Please choose an option:
1. Add a contact
2. Search for a contact
3. Delete a contact
4. Schedule an event
5. Print event details
6. Print contacts by first name
7. Print all events alphabetically
8. Exit

Enter your choice: 6

Enter the first name: Ahmad

Contacts found!
Name: Ahmad Al-Saud
Phone Number: 055-1234-5678
Email Address: ahmad.al-saud@example.com
Address: 123 King Fahd Road, Riyadh
Birthday: 01/01/1980
```

```
Notes: Friend from college

Name: Ahmad Alzaid
Phone number: 0553211234
Email address: ahmad.zaid@example.com
Address: 123 King Faisal Road, Riyadh
Birthday: 01/01/1989
Notes: Friend from work


Please choose an option:
1. Add a contact
2. Search for a contact
3. Delete a contact
4. Schedule an event
5. Print event details
6. Print contacts by first name
7. Print all events alphabetically
8. Exit

Enter your choice :8

Goodbye!
```

Note:

- Your code should be written with: proper indentation, comments, and proper naming of the variables, methods, and classes. All of these points will be graded.
- Using Java Collections is not permitted at this stage. All data structures used in this assignment must be implemented by you.
- Provide the time complexity (worst case analysis) of all methods discussed above using Big O notation. Your answer should show the steps followed when calculating the growth rate function and the big O.

Submission Guidelines:

- You are expected to work in teams, each team must contain at most 3 students.
- Submit a written report (in PDF format) answering the given questions. In addition to submitting your source code (compressed in ZIP format).
- After the submission, you will present a demo that demonstrates your working code to your instructor on a scheduled session.
- Your report should include a cover sheet including the names and IDs of your team members and the division of work among them.
- All submissions, should be made through LMS.
- The submitted work should be your own work. Any case of unethical conduct will result in an F in the class.