· **PDS LAB [Date: 22nd Oct 2024]**

Assignment – 7 [Searching, Sorting & Structures]

Instructions:

1. Create a directory named as Lab-7.
2. Give the name of the program as <p>.c where <p> implies the problem number, like 1.c, 2.c, 3.c, etc. Store all the programs of this week under this directory.
3. You should upload all .c files (1.c, 2.c, 3.c ....) to the Moodle course web page latest by 5.00 PM (without penalty). The cutoff time will be till 5.15 PM with a penalty of 25% on your secured marks (i.e., if you secured 80 marks, after penalty you will get 60 marks). Beyond 5.15 PM, the moodle system will not allow you to submit, as a result you will get zero.

Problem 1 : State and City Directory [60 Marks]

You are tasked with building a State and City Directory for a newly formed nation. The government wants to keep track of all the states and their respective cities for administrative purposes. Each state can have a different number of cities, and citizens must be able to search for information easily.

To manage this directory, you need to write a C program that dynamically stores the names of states and their cities using a 2D array. Here, each element of 2D array represents a character array meant for storing the name of a state or city. Based on citizens requests, desired information needs to be retrieved from the directory.

Setting up State and City directory Setup:

First, you'll need to set up the system by entering the names of the states and their corresponding cities. The number of states and the number of cities in each state will be determined by the user. First, user specify (enter through keyboard) the number of states in the directory (number of rows). Then for each state, user provides the name of the state and the number of cities (columns of each specific row). Then, input the names of the cities for that state. The directory shall be represented in 2D fashion, where the first column of all rows filled up with the names of the states, and the rest of the columns of each row will be filled up with the names of the cities of that particular state.

Citizen Requests:

After the directory is set up, the government needs to handle some common citizen queries:

(a) Display the entire directory : Citizens or administrators may request to see the entire directory of states and their cities. The program should print all the states and their respective cities.

(b) Check whether the given state name is present in the directory? If it is present, provide its name and its cities.

(c) Find which state a city belongs to : A citizen may ask which state a particular city is in. If the city exists, the program should return the name of the state; otherwise, it should notify that the city is not found.

(d) Sort the states alphabetically : A citizen wants to view a list of all states sorted in lexicographical (alphabetical) order.

(e) Sort the cities of a particular state alphabetically : A citizen wants to view a list of all cities of a particular state sorted in lexicographical (alphabetical) order.

(f) Sort states and cities alphabetically : A citizen wants to view the state-city directory in sorted fashion.

Write appropriate C functions to support the above mentioned citizen queries. Call these C functions from the main () function to demonstrate the state-city directory setup and citizen queries and their responses.

Example:

Input: (i) Specify the number states to be set up in the directory (number of rows). Specify the number of cities to be entered under each state, and provide the name of the state and its cities through keyboard.

Enter the number of states: 3
Enter the number of cities under state 1 : 4
Enter the name of state 1 and its cities : Maharashtra, Mumbai, Pune, Nagpur, Solapur
Enter the number of cities under state 2 : 2
Enter the name of state 2 and its cities : Himachal Pradesh, Kinnaur, Shimla
Enter the number of cities under state 3 : 3
Enter the name of state 3 and its cities : Karnataka, Bangalore, Mysore, Mangalore

Display the entire directory
Maharashtra, Mumbai, Pune, Nagpur, Solapur
Himachal Pradesh, Kinnaur, Shimla
Karnataka, Bangalore, Mysore, Mangalore

Provide the cities of state Tamilnadu
Tamilnadu doesn't exist in directory

Provide the cities of state Karnataka
Bangalore, Mysore, Mangalore

Find which state a city Mumbai belongs to
Maharashtra

Sort the states alphabetically
Himachal Pradesh, Karnataka, Maharashtra

Sort the cities of a particular state alphabetically: Maharashtra
Mumbai, Nagpur, Pune, Solapur

Sort states and cities alphabetically
Himachal Pradesh, Kinnaur, Shimla
Karnataka, Bangalore, Mangalore, Mysore
Maharashtra, Mumbai, Nagpur, Pune, Solapur

Problem-2 : Menu driven Book Shop **[40 Marks]**

Write a menu-driven C program to implement the functionality of a book shop.

The menu options are as follows:

(a) Add book details
(b) Display book details
(c) List all books of a given author
(d) List of books in the shop over the given price.
(e) List of books published in a given city.
(f) List of books from a given publisher with the price above some value.
(g) Sorted list of books in a shop based on price
(h) Exit

Use the following structure definitions in implementation:
struct book {char name[100]; char author[100]; publisher p; int price;};
typedef struct {char name[100]; char city[50]; int year;} publisher;

Write separate C functions to carry out each of the tasks mentioned under Menu.

Example:

MENU

Press 1 : Add book details
Press 2 : Display book details
Press 3 : List all books of a given author
Press 4 : List of books in the shop over the given price.
Press 5 : List of books published in a given city.
Press 6 : List of books from a given publisher with the price above some value.
Press 7 : Sorted list of books in shop based on price
Press 8 : Exit.

Enter Your Choice: 1
Add Details of Book

Book Name : Algo
Enter Author Name : Aditya
Enter Publication Name : Pearson
Enter Publication City : Pune
Enter Publication Year : 2011
Enter Price : 403

Enter Your Choice: 1
Add Details of Book

Book Name : OS
Enter Author Name : Eva
Enter Publication Name : McHill
Enter Publication City : Delhi
Enter Publication Year : 2015
Enter Price : 200

Enter Your Choice: 2
Details of All Books

Book Name	Author Name	Price	Publisher_name	Pub_city	Pub_year
Algo	Aditya	403	Pearson	Pune	2011
OS	Eva	200	McHill	Delhi	2015

THE END