Last Date for submission is March 10th, 2023

Problem-Based Assignment (21SW-I)

Of

Data Structure and Algorithms

21SW Batch

Dr. Mohsin Ali Memon

Dataset: https://www.kaggle.com/datasets/aneesayoub/world-universities-ranking-2022?select=Pak+top+100+universities.csv

Step 1: Make Objects for Pakistani universities storing Names, World ranking, Asia ranking, Pakistan ranking, location and number of publications.

Step 2: Make a Hash Table of Pakistani universities based on the 4 word key of university name (make a unique key for each university yourself) and store university objects as values in the hashtable.

Step 3: Now make a Stack of Pakistani universities (store 4 word keys only) which is based on the number of publications. The university having highest number of publications sits at the top of the stack and the university with lowest number sits at the bottom of the stack. (This might make your own ranking of the universities).

Step 4: Now make a Stack of Pakistani universities (store 4 word keys only) which is based on the ranking provided in the dataset. The university having highest ranking sits at the top of the stack and the university with lowest number of sits at the bottom of the stack.

Problem 1: How the university data (objects) can be searched using the 4 word key of university name from the hash table without collision.

Problem 2: How the methods like top 5, top 25, bottom 5, 50th percentile universities based on **number of publications** and **ranking** provided in the dataset can be made using the developed data structures. These methods must return complete information of the universities present in the dataset in presentable form (row and column on command line or GUI).

Problem 3: How to compare performance of universities on the provincial level and answer the question like which province is performing best and which is performing worst?

Make the algorithm and code for the above mentioned problems

Rubric for problem-based learning assignment

	Good (2.5 marks)	**Fair (1.5 mark)**	**Unsatisfactory (1 mark)**	**Not Submitted(0 mark)**
Data Structure creation	Demonstrates the ability to create data structures correctly.	Demonstrates a moderate level of ability to create data structures.	Not able to create data structures properly.	Not submitted
Organization & Structure of algorithms	The algorithms are well organized in a tight and logical fashion.	The algorithms are partially organized in a logical fashion.	The algorithms are not well organized in a tight and logical fashion.	Not submitted
Code Completeness	Demonstrates an in-depth, high-level understanding of the problems with complete code.	Demonstrates a moderate level of understanding of the problems with some code.	Fails to demonstrate an understanding of the problems and code.	Not submitted
Result Accuracy	The results presented are accurate.	The results presented are partially accurate.	The results are not in presentable form.	Not submitted

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Problem-Based Assignment (21SW-II)

Of

Data Structure and Algorithms

21SW Batch

Dr. Mohsin Ali Memon

Dataset: https://www.kaggle.com/datasets/syedasimalishah/auto-pedestrians-crashes

Step 1: Make a queue for the car crashes based on their time line from January to December (Day 1 to Day 31) and store day of week, crash type, light conditions, weather conditions and other necessary data.

Step 2: Make three sub queues from the original queue such as sub queues storing only clear weather crashes, snow weather crashes and rain weather crashes.

Step 3: Make seven sub queues (one for each day of the week) for all crashes.

Step 4: Make two binary trees to store total number of crashes for each month(use crash number as key) for both 'hit and run' and 'not hit and run' crash types.

Problem 1: How to find out which day (from Monday to Sunday) was the deadliest of all days as well as which months' Friday was the deadliest among all Fridays.

Problem 2: How to find the number of rainy day crashes in every month.

Problem 3: Which month had the lowest 'hit and run' and which month had the highest 'hit and run' crash cases (use binary tree already developed). Which month has lowest 'not hit and run' and which month had the highest 'not hit and run' crash cases

Postulate 1: Is it true that the weekends (Saturdays and Sundays) when the light conditions were dark, caused more crashes than Mondays and Tuesdays.

Make the algorithm and code (use GUI or command line for results) for the above mentioned problems

Rubric for problem-based learning assignment

	Good (2.5 marks)	**Fair (1.5 mark)**	**Unsatisfactory (1 mark)**	**Not Submitted(0 mark)**
Data Structure creation	Demonstrates the ability to create data structures correctly.	Demonstrates a moderate level of ability to create data structures.	Not able to create data structures properly.	Not submitted
Organization & Structure of algorithms	The algorithms are well organized in a tight and logical fashion.	The algorithms are partially organized in a logical fashion.	The algorithms are not well organized in a tight and logical fashion.	Not submitted
Code Completeness	Demonstrates an in-depth, high-level understanding of the problems with complete code.	Demonstrates a moderate level of understanding of the problems with some code.	Fails to demonstrate an understanding of the problems and code.	Not submitted
Result Accuracy	The results presented are accurate.	The results presented are partially accurate.	The results are not in presentable form.	Not submitted

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Problem-Based Assignment (21SW-III)

Of

Data Structure and Algorithms

21SW Batch

Dr. Mohsin Ali Memon

Dataset: https://www.kaggle.com/datasets/usgs/earthquake-database

Step 1: Use https://www.daniel-braun.com/technik/reverse-geocoding-library-for-java/ library to find out the city and country from the given coordinates and store them in yearly earthquake **collection** along with magnitude. (Collection of each year means 52 collections)

Step 2: Make a queue storing biggest (with highest magnitude) quake of each year with magnitude and country, starting from 1965 to 2016. (52 elements in the queue approx.).

Step 3: Make a stack from the collections, one for each country which stores earthquake and its magnitude in the order of the event (the most recent event on top).

Step 4: Make a linked list which saves the one most recent earthquake with magnitude and country name from each country (use the stack from step 3).

Problem 1: How to find the average number of earthquakes per year for each country and which country is most vulnerable to earthquakes (which country has the most number of earth quakes)?

Problem 2: Which are the biggest earthquakes from 2005 to 2015 occurred and in which country (use step 2)?

Problem 3: How to determine the recent 5 earthquakes from each country?

Problem 4: How to find the most recent above 6 magnitude earthquakes (use step 4).

Make the algorithm and code (GUI or command line for results) for the above mentioned problems.

Rubric for problem-based learning assignment

	Good (2.5 marks)	**Fair (1.5 mark)**	**Unsatisfactory (1 mark)**	**Not Submitted(0 mark)**
Data Structure creation	Demonstrates the ability to create data structures correctly.	Demonstrates a moderate level of ability to create data structures.	Not able to create data structures properly.	Not submitted
Organization & Structure of algorithms	The algorithms are well organized in a tight and logical fashion.	The algorithms are partially organized in a logical fashion.	The algorithms are not well organized in a tight and logical fashion.	Not submitted
Code Completeness	Demonstrates an in-depth, high-level understanding of the problems with complete code.	Demonstrates a moderate level of understanding of the problems with some code.	Fails to demonstrate an understanding of the problems and code.	Not submitted
Result Accuracy	The results presented are accurate.	The results presented are partially accurate.	The results are not in presentable form.	Not submitted