BAHRIA UNIVERSITY ISLAMABAD

ASSIGNMENT#01

NAME: MADEIHA ARSHAD
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SUBMITTED TO: SIR RAJA SULEIMAN
GROUP MEMBERS: MADEIHA ARSHAD &
EMAAN FATIMA

COMPUTER PROGRAMMING

ASSIGNMENT # 01

Question # 01

Finding the Shortest Path

Imagine you are developing a GPS navigation system. You are given a map with various locations and the roads connecting them. Your task is to write an algorithm to find the shortest path from one location to another. You can assume that you have a list of locations and the distance between each pair of locations. Your algorithm should output the shortest path and the total distance.

Step 1: Start

Step 2: Consider your current location as the starting point.

Step 3: Explore your nearby roads that are connected to your current location.

Step 4: Find the distance of each road.

Step 5: Choose the road which has the shortest distance.

Step 6: Travel along this road. Now call it your current location.

Step 7: Repeat steps from 3 to 6 until you reach your destination.

Step 8: Now finally you have found the shortest path.

Step 9: Stop

Question # 02

Sorting a list of Numbers

You are working on a project where you need to sort a list of numbers in ascending order. Design an algorithm to efficiently sort a list of integers. You should consider various sorting algorithms, evaluate their time complexity, and choose the most suitable one for the task.

Step 1: START

Step 2: Consider we have an unsorted list of numbers.

Step 3: Choose first element as pivot element from the unsorted list of numbers.

Step 4: Consider two pointers 'P' and 'Q', pointer 'P' will move towards R.H.S(it will increment one by one) until it will get the element greater than the pivot element and pointer 'Q' will move towards L.H.S(it is getting decrement) until it will get element lesser than the pivot element

Step 5: If 'P' and 'Q' are in the same position or 'Q' crosses 'P', then swap the 'Q' with pivoted element and in the same way if 'Q' didn't cross 'P' or didn't come equally then swap the pivoted element with 'P' while other elements will remain same. BY this, pivoted element will reach to its right position i.e., all the bigger elements will on the R.H.S and all the smaller ones will on the L.H.S.

Step 6: Now, repeat step 4 and step 5 until we will get the sorted list of numbers.

Step 6: STOP

TIME COMPLEXITY (QUICK SORT ALGORITHM)

Best/normal case: If the list has n elements and after the first pass pivoted element is in the middle of the list then the list will divide into two parts with pivoted element in the middle. This is the best or normal case.

$$T(n) = O(n \log n)$$

Worst case: In the worst case, pivoted element will remain at its exact position after each step.

$$T(n) = 0(n^2)$$

Question # 03

Calculating Fibonacci Numbers

The Fibonacci sequence is a series of numbers where each number is the sum of the two preceding ones (e.g., 0, 1, 1, 2, 3, 5, 8, 13, ...) Write an algorithm to calculate the nth Fibonacci number. Your algorithm should be efficient and capable of handling large values of n

Step 1: START

Step 2: Declare variables

Step 3: Consider the first two numbers of series, add them together to get the next number in the series.

Step 4: Similarly, continue adding the previous two numbers to get the next one in the series.

Step 5: Continue this process until we get the desired 'nth' number of the series.

Step 6: STOP

Question # 04:

Inventory Management

You are tasked with creating an algorithm for a store's inventory management system. Your algorithm should be able to add and remove items from the inventory, update the quantity of existing items, and generate reports of the items and their quantities. Design an algorithm that efficiently manages the store's inventory based on these requirements.

Step 1: Start

Step 2: Create an empty inventory list.

Step 3: To add an item to the inventory:

- Ask for the item details (name, quantity, etc.).
- Add the item to the inventory.

Step 4: To remove an item:

- Ask for the item name or ID.
- Remove the item from the inventory.

STEP 5: To update the quantity:

- Ask for the item name or ID and the new quantity.
- Update the quantity in the inventory.

STEP 6: To generate a report:

- Display the items and their quantities from the inventory.

Step 7: Stop