# Bahria University, Islamabad

## Department of Software Engineering

## Computer programming

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## Assignment : 1

| Task No: | Task Wise Marks | | Documentation Marks | | Total Marks (20) |
|---|---|---|---|---|---|
| | Assigned | Obtained | Assigned | Obtained | |
| 1 | 3 | | 5 | | |
| 2 | 3 | | | | |
| 3 | 3 | | | | |
| 4 | 3 | | | | |
| 5 | 3 | | | | |

**Comments:**

**Signature**

LAB

Assignment No: 01

# Task no: 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.

## ALGORITHM:

- Start.
- Create a map that represents locations and roads, and name the locations.
- List neighbors and distance with them.
- Create location with a name and add it to the map.
- Add roads that connect two locations.
- Create map to store current shortest distance to each location.
- Make a map to save previous locations and distances from those locations.
- Make a map to keep track of unvisited locations.
- Mark current location as visited.
- Initialize empty path list and current location then set a variable to ending location.
- Add current location to beginning of path list.
- Print shortest path.
- Print total distance.
- End.

# Task no: 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.

## ALGORITHM:

- Start.
- The list is already sorted if it contains one or zero elements.
- Choose a pivot element from list, it can be any element of your choice.
- Rearrange the list such that the pivot comes before the greater elements.
- Repeat above steps for eat sublist.
- After arranging each list you will get the final sorted list.
- End.

# Task no: 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.

## ALGORITHM:

- Start.
- Create a function to multiply two 2x2 matrices.
- Create a function that calculates power of a 2x2 matrix.
- In order to find nth Fibonacci number we will use matrix exponentiation.
- Set up Fibonacci matric as "**F**" and put initial values [1, 1] , [1, 0].
- If n is <= 0, return 0 as Fibonacci number.
- Use matrix power function to calculate **F** raised to power [n-1].
- The top left value is the Fibonacci number.

- End.

# Task no: 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.

## ALGORITHM:

- Start.
- Make an empty inventory list to store items and its quantities.
- Assign a name and initial quantity to the items.
- If the item is already there, increase its quantity.
- Remove an item from inventory by checking if its there or not and if it is, remove it.
- Check if the item is on the list, if it is change its quantity to new one if you want to update it.
- List all the items and their quantities.
- Display report to the user.
- End.