DESIGN & ANALYSIS OF ALGORITHMS

ASSIGNMENT 01

Name: *Muhammad Harris*

Registration Number: BCS203193

Section: 4

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Submitted to: Sir Syed Saqib

DATA STRUCTURES

Question 01

What is Data Structures?

Answer

In Computer Science, **Data Structures** are means of storing, organizing and managing data.

Question 02

What are the types of Data Structures?

Answer

Data structures are classified into two types,

- **Linear Data Structures:** Data structures in which data is stored consecutively or in a linear order are called Linear Data structures. For example Arrays, Stack, Queue, Linked List.
- **Non-Linear Data Structures:** Data structures in which data is stored in a random order are called Non-Linear Data Structures. For example Graph, Tree.

Question 03

Write C++ code for declaring different data structures.

Answer

```cpp
#include<iostream>
#include<queue>
#include<stack>

using namespace std;

// LINEAR DATA STRUCTURES
// Declaring Array
int Array[5]; // Static Array
int* Arr = new int[10]; // Dynamic Array

// Declaring Queue (using STL Library)
queue<int> Q;
Q.push(10); // to insert element
Q.pop(); // to remove element
```

```
// Declaring Stack (using STL Library)
stack<int> S;
S.push(10); // to insert element
S.pop(); // to remove element

// Declaring Linked List
struct LinkedListNode {
  int Data = 0;
  LinkedListNode* Next = NULL;
};
LinkedListNode* LinkedList = new LinkedListNode; // Linked List Head

// NON-LINEAR DATA STRUCTURES
// Declaring Tree
struct TreeNode {
    int Data = 0;
    TreeNode* LeftChild = NULL;
    TreeNode* RightChild = NULL;
};
TreeNode* TreeHead = new TreeNode; // Tree Root
TreeHead->LeftChid = new TreeNode; // to create child

// Declaring Graph
struct GraphNode {
    int Data = 0;
    GraphNode* Edges = NULL;
};
GraphNode *Vertex = new GraphNode;
```