TUTORIAL #8: Signals and Data Structures Part II

Faculty of Engineering and Applied Science
Operating Systems SOFE-3950U

74171 Group 11
Awais Ahmad - 100785259
Mithusan Arulampalam - 100787123
Jawad Kohja - 100786085
Mohammad Mohammadkhani - 100798165

Date: March 29, 2023

Conceptional Questions

1. **What is an Abstract Data Type (ADT)?**
   An Abstract Data Type is a type of data structure that only provides the interface to the data structure. Some examples of ADTs are arrays, lists, and stacks.

2. **Explain the difference between a queue (FIFO) and a stack (LIFO).**
   A queue uses FIFO (**First In First Out**) for its data while a stack uses LIFO (**Last In First Out**) for its data. In a **queue**, the elements are added on one side but removed from the other. You can add to the queue by using *enqueue()* and remove from the stack using *dequeue()*. In a **stack**, the elements are added and removed from the "top" of the stack. You can insert an element onto the top of the stack using *push()* and remove the top element using *pop()*.

3. **Name and briefly explain three types of data structures.**
   - **Stack:** A stack uses the LIFO method to organize its elements. Elements are added and removed from the top of the stack using the push() and pop() methods, respectively.
   - **Queue:** A queue uses the FIFO method to organize its elements. In a queue, elements are added to the "bottom" and removed from the "top" of the queue using the enqueue() and dequeue() methods.
   - **Linked List:** A linked list is used to separate elements that are stored consecutively. The last node of one element will point to the first node of the next element. The 3 types of linked lists are singly linked, doubly linked, and circular linked. In the circular linked list, the end of the last node points to the start of the first node rather than pointing to null.

4. **Explain what a binary tree is, what are some common operations of a binary tree?**
   A binary tree is an ordered tree. Each node can have a maximum of two children, and these nodes are ordered by left being less than the parent and right being more than the parent. The root node is the component at the peek of a tree's hierarchy. binary tree operations are **insert**, **left** and **right, delete**. insert adds a new value to the tree, and delete removes a node.

5. **Explain what a hash table (dictionary) is, what are common operations of a hash table?**
   A hash table is a list of values that are defined and accessed to a unique key.Like a dictionary, the values can be referenced by the key, or vice versa. Hash tables can use operations such as **insert** into, **search** for or **delete** a value from the table.