NANYANG TECHNOLOGICAL UNIVERSITY
School of Electrical & Electronic Engineering

EE2008/IM1001 Data Structures and Algorithms

Tutorial No. 5 (Sem 2, AY2021-2022)

1. Write an algorithm to implement the method `insertBefore(`p`,`e`)` (which insert a new node with data value e before the node at position p) of the LIST ADT, assuming that the LIST ADT is implemented using a doubly linked list.

2. Write an algorithm for an array-based implementation of the vector ADT that achieves $O(1)$ time for replacing an element at rank r with a new element k and return the old element.

3. A priority queue is implemented using two arrays. An item, consisting of a key and a data item, is inserted by putting it at the end of the arrays. Write an algorithm to delete an item with the highest priority from the priority queue.

4. Draw the 11-item hash table resulting from hashing the keys 12, 44, 13, 88, 23, 94, 11, 39, 20,16 and 5, using the hash function $h(i) = (2i + 5) \bmod 11$ and assume that collisions are handled by chaining.

5. Draw the 11-item hash table resulting from hashing the keys 12, 44, 13, 88, 23, 94, 11, 39, 20,16 and 5, using the hash function $h(i) = (2i + 5) \bmod 11$ and assume that collisions are handled by linear probing.

6. Draw the 7-item hash table resulting from hashing the keys 19, 26, 13, 48, 17 using the hash function $h(x) = x \bmod 7$. Assume that collisions are handled by double hashing using a second hash function $d(x) = 5 - (x \bmod 5)$.