

1806ICT Programming Fundamentals

Week 10 : Stacks, Queues, Linked Lists

1. Using the supplied stack program (stack.c), write a program that implements a queue data structure. A queue is a First In, First Out (FIFO) data structure whereas a stack is a Last In, First Out (LIFO) data structure. Note that a queue data structure can be created using two stack data structures (S1 and S2) where for queue add you always push the item onto S1 and before any queue remove you pop all items from S1 pushing them to S2 and then pop from S2 to give the item to be removed from the queue.
2. In the lecture slides on Linked Lists, the code for the function `deleteNode()` was given. This function deletes a node in the linked list that matches the input parameter `val`. There are two more delete operations that can be performed on linked lists:
 - a. `deleteHead()` – deletes the head node on the linked list
 - b. `deleteTail()` – deletes the tail node on the linked list

Write the code for these two functions and test them out with the rest of the functions given in the lecture.

3. Write a function to compute the number of nodes in a linked list. Test this function with the rest of the functions given in the lecture, and the two functions in Q1 above.
4. Write a function `reverse()` to reverse a linked list. For example, if a linked list currently contains the nodes with values 1 4 5 2 6 3 9 (in sequence), when the function `reverse()` is executed, the nodes in the linked list will be reversed and the linked list will contain the nodes with the values 9 3 6 2 5 4 1. The original head node with the value '1' is now the new tail node, while the original tail node with the value '9' is now the new head node.

Test the new `reverse()` function.

5. In the Stack lecture, the ADT stack was implemented with an array as shown below:

```
typedef struct Stack
{char s[MAXLEN];
  int top;
} stack;
```

Now, implement the ADT stack using a linked list.

6. Write a program to implement the doubly linked list shown in the Linked List lecture. Your program should have functions to insert nodes, delete nodes, and print out the list of nodes in the list.