BCSE II – Data Structure and Algorithms Lab

Assignment – 3

(To be completed during the lab session)

1. (a) Implement a stack using an array. Implement the stack interface using two functions `PUSH()` and `POP()`. You may assume that the number of elements inserted into the stack never exceeds 100,000.

Note: STACK uses the Last In First Out (LIFO) approach for its operations. Push and Pop operations will be done at the same end called *"top of the Stack"*.

(b) Implement the stack using linked list.

2. Implement a queue using linked list.

Add the following functions as operations on the queue:

- **Enqueue:** Adds a new element to the queue.
- **Dequeue:** Removes and returns the first (front) element from the queue.
- **Peek:** Returns the first element in the queue.
- **isEmpty:** Checks if the queue is empty.
- **Size:** Finds the number of elements in the queue.

3. (a) Write a function that will accept a sparse matrix and produce a matrix in a compact form.

(b) Write a function that will accept two compact matrices and add them to produce a resultant compact matrix.

(c) Write a function that will accept two compact matrices and multiply them to produce a resultant compact matrix.

(d) Read two large matrices from two different files one by one. Apply the function to obtain a compact matrix from the matrix read from the first file, store it and close the file. Do the same for the second file. Now call the add and multiply functions to obtain resultant compact matrices and print them.