(CSC111) Homework 8.1-8.4

Question 1. On pages 332-333 of the textbook there is Pseudocode for the ADT Stack Operations (Key Concepts) and UML diagram. On page 383 there is Pseudocode for the ADT Queue Operations (Key Concepts) and UML diagram.

The two operations that are most similar are "Push" from the Stack operations and "Enqueue" from the Queue operations. Both of these involve a new element being added to the data structure in a certain order. "Enqueue" adds an element to the end of the queue, while "Push" moves an element to the start of the stack. The two actions keep the existing elements and insert them in a certain sequence.

The two operations that are least similar are "Pop" from the Stack operations and "Dequeue" from the Queue operations. "Dequeue" removes the first item from the queue, while "Pop" takes the first element from the stack. When removing elements from the data structure, the actions behave differently and follow different protocols (LIFO for the stack and FIFO for the queue).

Question 2. On pages 391-396 of the textbook an array-based queue implementation is presented. Select a sentence or short passage that captures the most important feature of the array-based queue. Briefly explain why you chose this particular sentence or short passage.

"The size of the queue is maintained by an integer count." To manage the queue's components and guarantee appropriate operation, this sentence shows how the queue's size is tracked using an integer count. It implies that the count is used to control the insertion and removal of elements and to determine how many elements are in the queue.

Question 3. On pages 390-391 of the textbook an example is presented where a stack and a queue are used to determine whether string of characters is a palindrome. Stacks implement a LIFO (last in first out) protocol while Queues implement a FIFO (first in first out) protocol. Select a block of pseudocode (page 391) or sentence or short passage that best illustrates how the protocols are used together to identify string palindromes. Briefly explain why you selected this block of pseudocode or sentence or short passage.

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while (not.stack.isEmpty() and not queue.isEmpty())
        if (stack.pop() != queue.dequeue())
                return false
```

This block of pseudocode shows how the stack's LIFO protocol and the queue's FIFO protocol are combined to compare elements from the beginning and the end of the string to check for palindromes. While elements from the beginning of the string are dequeued from the queue, elements from the string's end are popped from the stack. The code efficiently checks for palindromes with stack and queue operations by comparing elements from both ends.