SCHOOL OF COMPUTER SCIENCES
UNIVERSITI SAINS MALAYSIA
Semester II Session 2023/2024

CPT113 – Programming Methodology & Data Structures
Tutorial Week 11

Stacks and Queues

Learning Outcomes:

- Understanding the use of static and dynamic stacks and queues

1. Using the stack ADT defined in the lecture notes (DynIntStack), create a member function which is able to search an item inside the stack without violating the preliminary rules of a stack (FILO). Upon finding or not finding the search item print a suitable message. If the item is found remove it from the stack. The order of the stack should remain untouched in case of removing the item.

2. Based on your Stack ADT, convert it into Stack Template.

3. Given the following myStack class:

```
class myStack {
      myStack stackCopy(const myStack);
      const myStack& operator=(const myStack&);
      bool isEmptyStack() const;
      bool isFullStack() const;
      void initializeStack(); //Function to initialize the stack to an
      empty state.
      void push(const int& newItem);
      void pop(const int& item);
      myStack();
      ~myStack();
};
```

Construct a complete method for stackCopy using available methods in class myStack.

4. Describe the two operations that all queues perform.

5. Consider the following statements:

```
queueType<int> queue;
int x, y;
```

Assume queue is empty, show what is output by the following segment of code:

```
x = 6;
y = 8;
queue.enqueue(x);
queue.enqueue(y);
queue.dequeue(x);
queue.enqueue(x + 5);
queue.enqueue(16);
queue.enqueue(x);
queue.enqueue(y - 3);
cout << "Queue Elements: ";
while (!queue.isEmpty())
{
queue.dequeue(x);
cout << x << " ";
}
```

6. (a) Construct a header file for a dynamic queue using template to work on any data types.
   (b) Demonstrate a main program that creates a dynamic queue that can hold a series of double type values multiplied by the constant, pi. Then dequeue all these values and display them. Use header file in (a).
   (c) Demonstrate a main program that creates a dynamic queue that can hold strings, then prompts the user to enter a series of names that are enqueue. Then dequeue all the names and display them. Use header file in (a).

7. Construct a program that opens a text file and reads its contents into a queue of characters. The program should then dequeue each character and substitute it with the character that comes five places after it in the ASCII character set (e.g. a will become f), and store it in a second file. Use the same queue header file from the previous question.

8. Construct a program that opens two text files and reads its contents into two separate queues. Determine whether the files are identical using these queues. Display appropriate messages.