

CIS 720: Programming Assignment 2
30 points, Due Oct 10th

You need to write a program to control access to two queues, Q1 and Q2. There are the following types of threads:

- Enqueue1: This thread enqueues data items into Q1
- Transfer: This thread dequeues an element from Q1, modifies the data item, and enqueues it into Q2.
- Dequeue2: This thread dequeues data items from Q2.
- Max: This thread returns the max data items in Q2.

Assume that the data items are integers. You need to ensure the following constraints:

- Max threads merely examine the queue; hence, they can execute concurrently with one another.
- Enqueue1 threads add items to the rear and must execute in a mutually exclusive manner
- Dequeue2 threads delete items from the front of the queue and execute in a mutually exclusive manner
- You must allow inserters and deleters to operate concurrently whenever possible.
- The minimum length of each queue must be 3 and the maximum length must be 6.

Design and implement a semaphore-based algorithm for queue maintenance that maximizes parallelism. You must include a document describing the use of invariant based design methodology used to arrive at the solution. You may implement the queue using a circular array.