1. How many threads are you going to use? Specify the task that you intend each thread to perform.

n threads for n customers, 4 threads for each clerk, total is n+4.

2. Do the threads work independently? Or, is there an overall “controller” thread?

Threads are independent.

3. How many mutexes are you going to use? Specify the operation that each mutex will guard.

5, one for each clerk and one for both queues (business and economy)

4. Will the main thread be idle? If not, what will it be doing?

It will be idle.

5. How are you going to represent customers? what type of data structure will you use?

As type customer in an array.

6. How are you going to ensure that data structures in your program will not be modified concurrently?

Once the customer information has be modified, the only function available to change the information is to just pop the front customer from the queue.

7. How many convars are you going to use?

6, one for each queue and one for each clerk

For each convar:

(a)Describe the condition that the convar will represent.

Queue:next customer there?
Clerk:next clerk available?

(b)Which mutex is associated with the convar? Why?

Queue: the main queue mutex
Clerk: clerk mutex

(c)What operation should be performed once pthread cond wait() has been unblocked and re-acquired the mutex?

Queue: process customer
Clerk: unblock mutex so clerk can serve next customer

8. Briefly sketch the overall algorithm you will use.

Get customer info into array

Create threads

Lock queue mutex
Insert customer into correct queue (business or econ)

Customer waits for clerk thread to broadcast they are ready to serve a customer

Clerk locks the queue mutex

If customers are in a queue, broadcast to queue clerk is ready to serve

Clerk unlocks the queue mutex

Serve customer for service time allocated

Unlock queue mutex and unblock clerk convar

Clerk locks their clerk mutex

Clerk waits for signal from customer to signal they are finished

Clerk unlocks clerk mutex and is ready to serve next customer

Once all customers are served print out final statistics