

EECE 4029: Operating Systems and Systems Programming

SPRING 2022

HOMEWORK III

Given: Feb. 25, 2022

Programming problem:

Design a programming solution to the bounded-buffer problem using the producer and consumer processes shown in Chapter 5 of textbook. Use standard counting semaphores for empty and full and a mutex lock to represent mutex. The producer and consumer—running as separate threads—will move items to and from a buffer that is synchronized with the empty, full, and mutex structures. Please check the attached code, where the main() function and the producer and consumer functions are given. Your task is to implement the insert_item() and remove_item() functions which manipulate the buffer:

```
int insert_item(buffer item item) {
    /* insert item into buffer
    return 0 if successful, otherwise
    return -1 indicating an error condition */
}

int remove_item(buffer item *item) {
    /* remove an object from buffer
    placing it in item
    return 0 if successful, otherwise
    return -1 indicating an error condition */
}
```

The attached code uses Pthreads API. You can also solve this problem using Windows API or Java.

Please submit your source code for this question. To receive full credits for this problem, please include screen shots of your test results.

```
osc@ubuntu:~/q6$ ./buff 20 1 1
0
0
0
Producer produced 480256653
Consumer consumed 480256653
Producer produced 770534813
Consumer consumed 770534813
Producer produced 520788446
Consumer consumed 520788446
Producer produced 229178799
Producer produced 149971647
Consumer consumed 149971647
Consumer consumed 229178799
Producer produced 1274393328
Consumer consumed 1274393328
Producer produced 555082368
Consumer consumed 555082368
Producer produced 475145391
Consumer consumed 475145391
Producer produced 1260565385
Consumer consumed 1260565385
Producer produced 2133522971
Consumer consumed 2133522971
osc@ubuntu:~/q6$
```

```
osc@ubuntu:~/q6$ ./buff 5 7 7
0
0
0
Producer produced 111611770
Producer produced 1301375840
Consumer consumed 1301375840
Consumer consumed 111611770
Producer produced 300697841
Consumer consumed 300697841
Producer produced 648032478
Consumer consumed 648032478
Producer produced 1128338295
Consumer consumed 1128338295
Producer produced 688638490
Consumer consumed 688638490
Producer produced 533485486
Consumer consumed 533485486
Producer produced 647455583
Consumer consumed 647455583
Producer produced 1797302644
Consumer consumed 1797302644
Producer produced 1247333895
Producer produced 127587445
Consumer consumed 127587445
Consumer consumed 1247333895
Producer produced 1832169888
Consumer consumed 1832169888
osc@ubuntu:~/q6$ _
```