Assessed Coursework: Producer-Consumer

Login/Owner: **kn3118**

```
-UU-:----F1  main.cc        Top L5     Git:master   (C++/l /
-*- mode: compilation; default-directory: "~/given/" -*-
Compilation started at Tue Dec  4 17:05:38

make -k
g++    -c -o helper.o helper.cc
g++ -Wall -c helper.cc main.cc
g++ -Wall -pthread -o main helper.o main.o

Compilation finished at Tue Dec  4 17:05:40
```

Compilation of the program

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key        semid      owner      perms      nsems

[kn3118@vm-shell2:~/given$ ./main 5 6 2 3
 Producer(2): Job id 1 duration 4
 Producer(1): Job id 2 duration 7
 Producer(2): Job id 3 duration 3
 Consumer(3): Job id 1 executing sleep duration 4
 Consumer(2): Job id 2 executing sleep duration 7
 Producer(1): Job id 4 duration 9
 Producer(2): Job id 5 duration 9
 Consumer(1): Job id 3 executing sleep duration 3
 Consumer(3): Job id 1 completed
 Consumer(1): Job id 3 completed
 Consumer(2): Job id 2 completed
 Producer(1): Job id 1 duration 6
 Producer(2): Job id 2 duration 10
 Consumer(3): Job id 4 executing sleep duration 9
 Consumer(1): Job id 5 executing sleep duration 9
 Consumer(2): Job id 1 executing sleep duration 6
 Producer(1): Job id 3 duration 4
 Consumer(2): Job id 1 completed
 Consumer(3): Job id 4 completed
 Consumer(1): Job id 5 completed
 Producer(2): Job id 4 duration 9
 Producer(1): Job id 5 duration 1
 Consumer(2): Job id 2 executing sleep duration 10
 Consumer(3): Job id 3 executing sleep duration 4
 Consumer(3): Job id 3 completed
 Producer(2): Job id 1 duration 3
 Producer(2): No more jobs to generate.
 Consumer(1): Job id 4 executing sleep duration 9
 Producer(1): Job id 2 duration 3
 Consumer(3): Job id 5 executing sleep duration 1
 Producer(1): No more jobs to generate.
 Consumer(3): Job id 5 completed
 Consumer(3): Job id 1 executing sleep duration 3
 Consumer(2): Job id 2 completed
 Consumer(2): Job id 2 executing sleep duration 3
 Consumer(3): Job id 1 completed
 Consumer(2): Job id 2 completed
 Consumer(1): Job id 4 completed
 Consumer(3): No more jobs left.
 Consumer(1): No more jobs left.
 Consumer(2): No more jobs left.
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key        semid      owner      perms      nsems
```

Case 1:

Size of queue = 5
Number of jobs to generate for each producer = 6
Number of producers = 2
Number of consumers = 3

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid      owner       perms       nsems

[kn3118@vm-shell2:~/given$ ./main 0 6 2 3
Consumer(3): No more jobs left.
Producer(2): Quits because no jobs arrived for 20 seconds
Producer(1): Quits because no jobs arrived for 20 seconds
Consumer(1): No more jobs left.
Consumer(2): No more jobs left.
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid      owner       perms       nsems
```

Case 2:

Size of queue = 0
Number of jobs to generate for each producer = 6
Number of producers = 2
Number of consumers = 3

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid      owner       perms       nsems

[kn3118@vm-shell2:~/given$ ./main 2 0 2 3
Producer(1): No more jobs to generate.
Producer(2): No more jobs to generate.
Consumer(1): No more jobs left.
Consumer(2): No more jobs left.
Consumer(3): No more jobs left.
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid      owner       perms       nsems
```

Case 3:

Size of queue = 2
Number of jobs to generate for each producer = 0
Number of producers = 2
Number of consumers = 3

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid      owner       perms       nsems

[kn3118@vm-shell2:~/given$ ./main 2 3 0 3
Consumer(1): No more jobs left.
Consumer(2): No more jobs left.
Consumer(3): No more jobs left.
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid      owner       perms       nsems
```

Case 4:

Size of queue = 2
Number of jobs to generate for each producer = 3
Number of producers = 0
Number of consumers = 3

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner      perms      nsems

[kn3118@vm-shell2:~/given$ ./main 2 3 2 0
Producer(1): Job id 1 duration 8
Producer(2): Job id 2 duration 8
Producer(1): Quits because no jobs arrived for 20 seconds
Producer(2): Quits because no jobs arrived for 20 seconds
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner      perms      nsems
```

Case 5:

Size of queue = 2
Number of jobs to generate for each producer = 3
Number of producers = 2
Number of consumers = 0

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner       perms       nsems

[kn3118@vm-shell2:~/given$ ./main 1 3 0 0
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner       perms       nsems
```

Case 6:

Size of queue = 1
Number of jobs to generate for each producer = 3
Number of producers = 0
Number of consumers = 0

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner      perms      nsems

[kn3118@vm-shell2:~/given$ ./main 2 3 2 4 1
Incorrect number of coomand line arguments
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner      perms      nsems
```

Case 7:

Incorrect number of command line arguments (6 arguments provided)

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner      perms      nsems

[kn3118@vm-shell2:~/given$ ./main 1 3 3
Incorrect number of coomand line arguments
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key         semid     owner      perms      nsems
```

Case 8:

Incorrect number of command line arguments (4 arguments provided)

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid       owner        perms       nsems

[kn3118@vm-shell2:~/given$ ./main 2 3 b 4
The input for the number of producers is invalid
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid       owner        perms       nsems
```

Case 9:

Incorrect command line argument (character value)

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid       owner        perms       nsems

[kn3118@vm-shell2:~/given$ ./main -1 3 3 2
The input for the size of the queue is invalid
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid       owner        perms       nsems
```

Case 10:

Incorrect command line argument (negative value)

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid       owner        perms       nsems
0x00000018 11272192   kn3118       666         3

[kn3118@vm-shell2:~/given$ ./main 2 3 2 4
The sem_id has already been created
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid       owner        perms       nsems
0x00000018 11272192   kn3118       666         3
```

Case 11:

Failure to create the semaphore set with the specific id

```
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid      owner      perms      nsems

[kn3118@vm-shell2:~/given$ ./main 1 3 5 1
Producer(1): Job id 1 duration 8
Consumer(1): Job id 1 excecuting sleep duration 8
Producer(3): Job id 1 duration 4
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 4
Producer(4): Job id 1 duration 3
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 3
Producer(2): Job id 1 duration 9
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 9
Producer(5): Job id 1 duration 7
Producer(1): Quits because no jobs arrived for 20 seconds
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 7
Producer(3): Job id 1 duration 2
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 2
Consumer(1): Job id 1 completed
Producer(4): Job id 1 duration 3
Consumer(1): Job id 1 excecuting sleep duration 3
Producer(2): Job id 1 duration 10
Producer(5): Quits because no jobs arrived for 20 seconds
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 10
Producer(3): Job id 1 duration 6
Producer(3): No more jobs to generate.
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 6
Producer(4): Job id 1 duration 10
Producer(4): No more jobs to generate.
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 10
Producer(2): Job id 1 duration 8
Producer(2): No more jobs to generate.
Consumer(1): Job id 1 completed
Consumer(1): Job id 1 excecuting sleep duration 8
Consumer(1): Job id 1 completed
Consumer(1): No more jobs left.
[kn3118@vm-shell2:~/given$ ipcs -s

------ Semaphore Arrays --------
key          semid      owner      perms      nsems
```

Case 12:

Size of queue = 1
Number of jobs to generate for each producer = 3
Number of producers = 5
Number of consumers = 1

In this example Producer(1) and Producer(5) quit before they produce all their jobs because they could not produce a job for 20 seconds.