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CS492 HW1 Experimentation and Analysis

Experimentation Writeup

Based on the various test cases we have observe the following behavior for various input parameters:

- First, the difference between turnaround time and wait time is almost always negligible
- The size of the quantum heavily affects the consumer throughput, if the quantum is very low, the throughput is very slow. As the quantum approaches the maximum possible life, the consumer throughput approaches the producer throughput, but the consumer throughput is always bounded by the producer throughput.
- For a large number of products and a small queue size, first come first serve is significantly faster
- FCFS is far better for producer throughput in all cases that we tested
- Since consumer throughput is directly affected by producer throughput, this means that FCFS is also better in terms of consumer throughput
- FCFS was also superior in identical cases in terms of total run time
- In identical cases, the average turnaround and wait times were larger for Round Robin, however the minimum wait and turnaround times in FCFS and RR were similar in some cases
- In cases with a small amount of products and a small queue size, the average turn around and wait times were still better for FCFS than for RR. FCFS also beats RR in these metrics in cases of large amounts of products

cases:

./assign1 4 4 100 10 1 20 4

```
=====
Time Metrics
=====
Total Runtime: 67082.000000
minTurn: 300.000000, maxTurn: 12816.000000, avgTurn: 6535.980000
minWait: 300.000000, maxWait: 12816.000000, avgWait: 6535.940000
prodThrough: 97.282573
consThrough: 89.442772
```

```
=====
Time Metrics
=====
Total Runtime: 67084.000000
minTurn: 300.000000, maxTurn: 12816.000000, avgTurn: 6536.120000
minWait: 300.000000, maxWait: 12816.000000, avgWait: 6536.110000
prodThrough: 97.279419
consThrough: 89.440105
```

```
=====
Time Metrics
=====
Total Runtime: 67086.000000
minTurn: 301.000000, maxTurn: 12816.000000, avgTurn: 6536.270000
minWait: 301.000000, maxWait: 12816.000000, avgWait: 6536.250000
prodThrough: 97.277842
consThrough: 89.437439
```

./assign1 4 4 100 10 1 200 6

```
=====
Time Metrics
=====
Total Runtime: 8211.000000
minTurn: 200.000000, maxTurn: 1501.000000, avgTurn: 782.930000
minWait: 200.000000, maxWait: 1501.000000, avgWait: 782.920000
prodThrough: 768.245839
consThrough: 730.727073
```

```
=====
Time Metrics
=====
Total Runtime: 8212.000000
minTurn: 200.000000, maxTurn: 1503.000000, avgTurn: 783.060000
minWait: 200.000000, maxWait: 1503.000000, avgWait: 783.040000
prodThrough: 768.147484
consThrough: 730.638091
```

```
=====
Time Metrics
=====
Total Runtime: 8211.000000
minTurn: 200.000000, maxTurn: 1502.000000, avgTurn: 782.970000
minWait: 200.000000, maxWait: 1502.000000, avgWait: 782.950000
prodThrough: 768.245839
consThrough: 730.727073
```

./assign1 4 4 100 10 0 20 5

```
=====
Time Metrics
=====
Total Runtime: 2804.000000
minTurn: 200.000000, maxTurn: 301.000000, avgTurn: 225.290000
minWait: 200.000000, maxWait: 301.000000, avgWait: 225.290000
prodThrough: 2396.166134
consThrough: 2139.800285
```

```
=====
Time Metrics
=====
Total Runtime: 2804.000000
minTurn: 200.000000, maxTurn: 301.000000, avgTurn: 225.360000
minWait: 200.000000, maxWait: 301.000000, avgWait: 225.360000
prodThrough: 2396.166134
consThrough: 2139.800285
```

```
=====
Time Metrics
=====
Total Runtime: 2804.000000
minTurn: 200.000000, maxTurn: 301.000000, avgTurn: 225.410000
minWait: 200.000000, maxWait: 301.000000, avgWait: 225.380000
prodThrough: 2396.166134
consThrough: 2139.800285
```

./assign1 100 1 300 1 1 20 5 -NOTE this test case took 11 minutes to run, round robin is very inefficient with a low number of consumers and a low quantum

```
=====
Time Metrics
=====
Total Runtime: 745439.000000
minTurn: 100.000000, maxTurn: 5208.000000, avgTurn: 2484.386667
minWait: 100.000000, maxWait: 5208.000000, avgWait: 2484.366667
prodThrough: 24.287073
consThrough: 24.146845
```

./assign1 20 1 15 10 1 20 5

```
=====
Time Metrics
=====
Total Runtime: 42424.000000
minTurn: 302.000000, maxTurn: 41221.000000, avgTurn: 23936.066667
minWait: 302.000000, maxWait: 41221.000000, avgWait: 23936.000000
prodThrough: 48.769914
consThrough: 21.214407
```

```
=====
Time Metrics
=====
Total Runtime: 42419.000000
minTurn: 302.000000, maxTurn: 41214.000000, avgTurn: 23932.600000
minWait: 302.000000, maxWait: 41214.000000, avgWait: 23932.600000
prodThrough: 48.767272
consThrough: 21.216908
```

```
=====
Time Metrics
=====
Total Runtime: 42414.000000
minTurn: 301.000000, maxTurn: 41209.000000, avgTurn: 23930.133333
minWait: 301.000000, maxWait: 41209.000000, avgWait: 23930.133333
prodThrough: 48.775201
consThrough: 21.219409
```

./assign1 20 1 15 10 0 20 5

```
=====
Time Metrics
=====
Total Runtime: 1502.000000
minTurn: 0.000000, maxTurn: 1002.000000, avgTurn: 634.266667
minWait: 0.000000, maxWait: 1002.000000, avgWait: 634.266667
prodThrough: 1796.407186
consThrough: 599.201065
```



```
=====
Time Metrics
=====
Total Runtime: 1503.000000
minTurn: 0.000000, maxTurn: 1002.000000, avgTurn: 634.533333
minWait: 0.000000, maxWait: 1001.000000, avgWait: 634.466667
prodThrough: 1792.828685
consThrough: 598.802395
```

```
=====
Time Metrics
=====
Total Runtime: 1502.000000
minTurn: 0.000000, maxTurn: 1002.000000, avgTurn: 634.200000
minWait: 0.000000, maxWait: 1002.000000, avgWait: 634.200000
prodThrough: 1796.407186
consThrough: 599.201065
```

./assign1 1 20 1500 10 1 20 5

```
=====
Time Metrics
=====
Total Runtime: 224656.000000
minTurn: 0.000000, maxTurn: 3316.000000, avgTurn: 1450.786667
minWait: 0.000000, maxWait: 3316.000000, avgWait: 1450.752000
prodThrough: 402.049559
consThrough: 400.612492
```

```
=====
Time Metrics
=====
Total Runtime: 224485.000000
minTurn: 0.000000, maxTurn: 3316.000000, avgTurn: 1449.688667
minWait: 0.000000, maxWait: 3316.000000, avgWait: 1449.652667
prodThrough: 402.356917
consThrough: 400.917656
```

```
=====
Time Metrics
=====
Total Runtime: 224439.000000
minTurn: 0.000000, maxTurn: 3313.000000, avgTurn: 1449.374000
minWait: 0.000000, maxWait: 3313.000000, avgWait: 1449.334000
prodThrough: 402.437879
consThrough: 400.999826
```

./assign1 1 20 1500 10 0 20 5

```
=====
Time Metrics
=====
Total Runtime: 150611.000000
minTurn: 2.000000, maxTurn: 907.000000, avgTurn: 900.752667
minWait: 2.000000, maxWait: 907.000000, avgWait: 900.726000
prodThrough: 597.569882
consThrough: 597.565915
```

```
=====
Time Metrics
=====
Total Runtime: 150597.000000
minTurn: 1.000000, maxTurn: 907.000000, avgTurn: 900.668000
minWait: 1.000000, maxWait: 907.000000, avgWait: 900.638667
prodThrough: 597.625435
consThrough: 597.621467
```

```
=====
Time Metrics
=====
Total Runtime: 150599.000000
minTurn: 1.000000, maxTurn: 908.000000, avgTurn: 900.654667
minWait: 1.000000, maxWait: 908.000000, avgWait: 900.636000
prodThrough: 597.617498
consThrough: 597.613530
```

./assign1 1 20 15 10 1 20 5

```
=====
Time Metrics
=====
Total Runtime: 3116.000000
minTurn: 202.000000, maxTurn: 2913.000000, avgTurn: 1520.266667
minWait: 202.000000, maxWait: 2913.000000, avgWait: 1520.266667
prodThrough: 471.204188
constThrough: 288.831836
```

```
=====
Time Metrics
=====
Total Runtime: 3118.000000
minTurn: 201.000000, maxTurn: 2916.000000, avgTurn: 1522.200000
minWait: 201.000000, maxWait: 2916.000000, avgWait: 1522.200000
prodThrough: 470.957614
constThrough: 288.646568
```

```
=====
Time Metrics
=====
Total Runtime: 3116.000000
minTurn: 201.000000, maxTurn: 2914.000000, avgTurn: 1520.666667
minWait: 201.000000, maxWait: 2914.000000, avgWait: 1520.666667
prodThrough: 471.204188
constThrough: 288.831836
```

./assign1 20 30 15 10 1 1000 5

```
=====
Time Metrics
=====
Total Runtime: 105.000000
minTurn: 0.000000, maxTurn: 3.000000, avgTurn: 1.400000
minWait: 0.000000, maxWait: 3.000000, avgWait: 1.400000
prodThrough: 8653.846154
constThrough: 8571.428571
```

```
=====
Time Metrics
=====
Total Runtime: 103.000000
minTurn: 0.000000, maxTurn: 3.000000, avgTurn: 1.400000
minWait: 0.000000, maxWait: 3.000000, avgWait: 1.400000
prodThrough: 8823.529412
constThrough: 8737.864078
```

```
=====
Time Metrics
=====
Total Runtime: 104.000000
minTurn: 0.000000, maxTurn: 2.000000, avgTurn: 1.266667
minWait: 0.000000, maxWait: 2.000000, avgWait: 1.266667
prodThrough: 8653.846154
consThrough: 8653.846154
```

./assign1 20 30 15 10 1 500 5

```
=====
Time Metrics
=====
Total Runtime: 104.000000
minTurn: 1.000000, maxTurn: 3.000000, avgTurn: 1.666667
minWait: 1.000000, maxWait: 3.000000, avgWait: 1.666667
prodThrough: 8653.846154
consThrough: 8653.846154
```

```
=====
Time Metrics
=====
Total Runtime: 104.000000
minTurn: 0.000000, maxTurn: 3.000000, avgTurn: 1.733333
minWait: 0.000000, maxWait: 3.000000, avgWait: 1.733333
prodThrough: 8653.846154
consThrough: 8653.846154
```

```
=====
Time Metrics
=====
Total Runtime: 104.000000
minTurn: 1.000000, maxTurn: 3.000000, avgTurn: 1.666667
minWait: 1.000000, maxWait: 3.000000, avgWait: 1.666667
prodThrough: 8653.846154
consThrough: 8653.846154
```

./assign1 20 30 15 10 1 20 5


```
=====
Time Metrics
=====
Total Runtime: 1508.000000
minTurn: 2.000000, maxTurn: 1309.000000, avgTurn: 771.000000
minWait: 2.000000, maxWait: 1309.000000, avgWait: 770.866667
prodThrough: 1276.595745
consThrough: 596.816976
```

```
=====
Time Metrics
=====
Total Runtime: 1509.000000
minTurn: 2.000000, maxTurn: 1309.000000, avgTurn: 771.266667
minWait: 2.000000, maxWait: 1309.000000, avgWait: 771.066667
prodThrough: 1274.787535
consThrough: 596.421471
```

```
=====
Time Metrics
=====
Total Runtime: 1509.000000
minTurn: 1.000000, maxTurn: 1310.000000, avgTurn: 772.066667
minWait: 1.000000, maxWait: 1310.000000, avgWait: 772.066667
prodThrough: 1271.186441
consThrough: 596.421471
```