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CS-342

Project 2

Introduction

I will be showing the average waiting times on different parameters and algorithms. I will examine different avgA values (300, 600, 1000, 2000) and N values (3, 5, 7, 10))while keeping other params constant (avgB = 300, minA = 100, minB= 100, bcount = 10) and see average waiting times. Then, for the second experiment, I will use different burst counts with different N values with the same params (avgA = 1000, avgB= 1000, minA= 100, minB= 100) and see average waiting times. Then, I will examine different avgB values' effect on the average waiting time in the third experiment.

Every time value is in milliseconds for both experiments.

Graphics

In all graphs, vertical values(3, 5, 7, 10) are thread counts(N). As the N goes high, average waiting time increases as expected, because more thread creates more bursts and the queue becomes busier. Thus, bursts wait longer than lower N values. Colors in the right indicates avgA values for the lines.

Algorithm SJF:

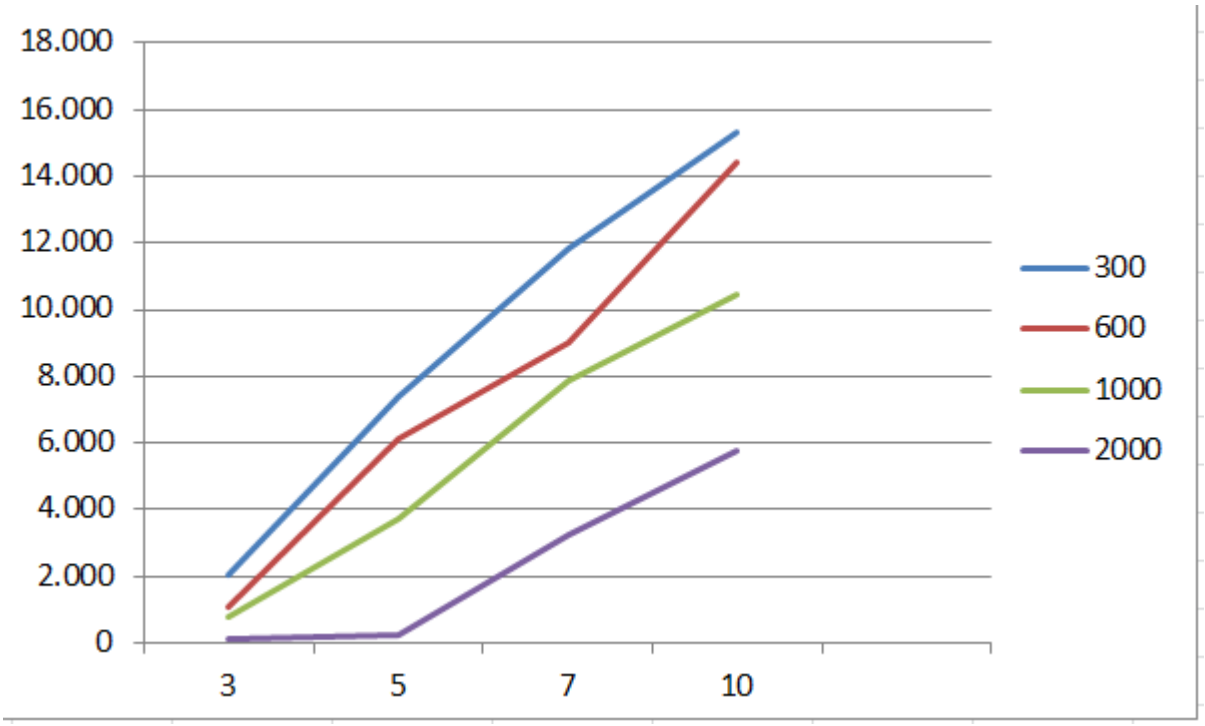

Figure 1: SJF with different avgA values

As indicated above, with the increasing avgA value, average waiting time decreases. It reaches below 6000 ms with 2000 avgA value and above 15000 ms waiting time with 300 avgA value. It decreases because increasing avgA value makes the thread sleep more before creating a burst, hence the bursts are added to the queue later which gives S thread more time to execute the ones in the queue. Thus, waiting time decreases with increasing avgA value. Also, the algorithm SJF makes the waiting time decrease as we look at the other algorithms.

Algorithm FCFS:

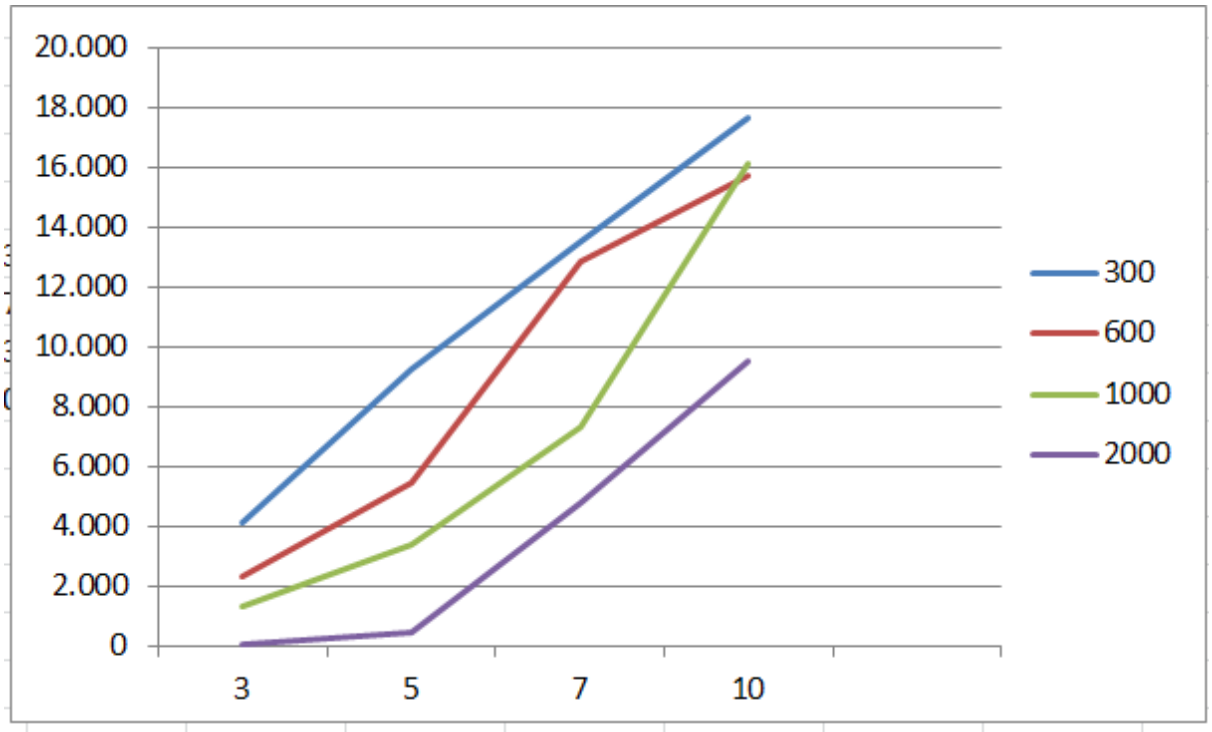

Figure 2: FCFS with different avgA values

This plot refers to the FCFS algorithm. Waiting time decreases as avgA value increases. It reaches below 10000 ms with 2000 avgA value and above 17000 ms waiting time with 300 avgA value. It decreases because increasing avgA value makes the thread sleep more before creating a burst, hence the bursts are added to the queue later which gives S thread more time to execute the ones in the queue. Thus, waiting time decreases with increasing avgA value. The FCFS algorithm is worse than SJF in terms of average waiting times as we compared the graphs.

Algorithm PRIO:

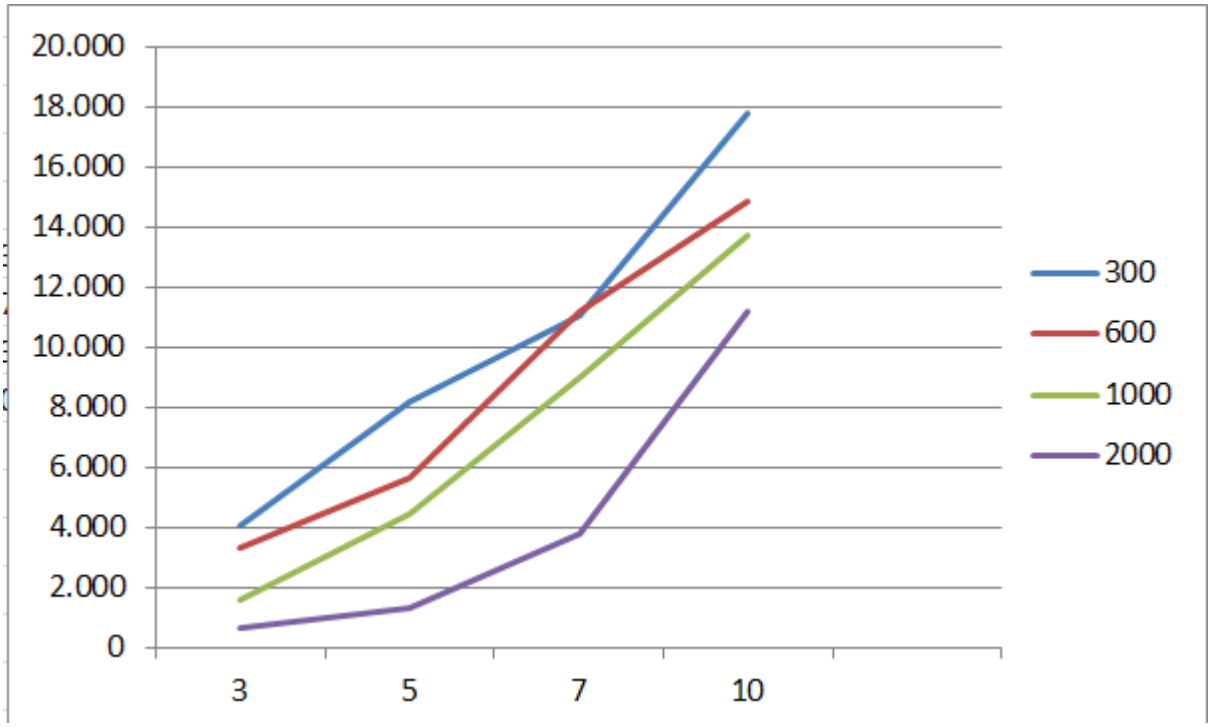

Figure 3: PRIO with different avgA values

The PRIO algorithm's plot is given above. Waiting time decreases as avgA value increases.It reaches below 12000 ms with 2000 avgA value and 18000 ms waiting time with 300 avgA value. The PRIO algorithm has longer waiting times when compared to SJF and FCFS. It has the longest average waiting time among other scheduling algorithms.

Algorithm VRUNTIME:

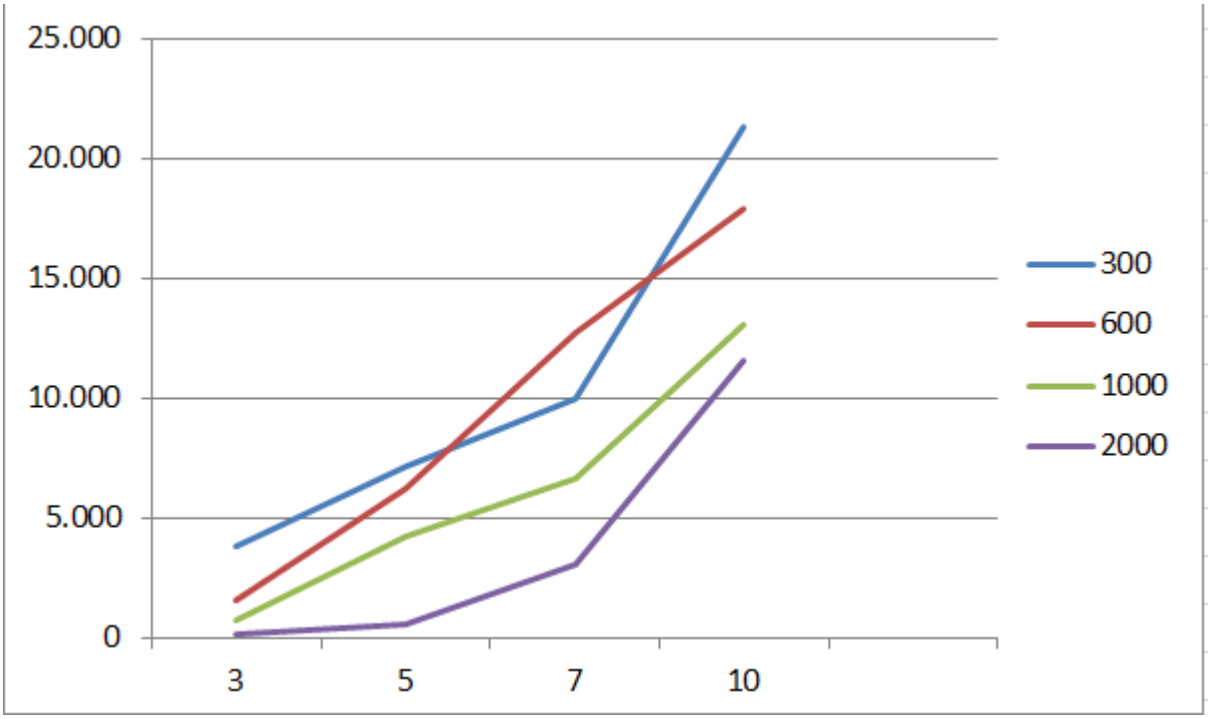

Figure 4: VRUNTIME with different avgA values

The VRUNTIME algorithm's plot is given above. Waiting time decreases as avgA value increases.It reaches over 20000 ms waiting time with 300 avgA value and around 11000 ms waiting time with 2000 avgA value. The VRUNTIME algorithm has a similar waiting time to the PRIO, but it is worse than FCFS and SJF.

Experiment 2

Graphs

In all graphs, vertical values(3, 5, 7, 10) are thread counts(N). As the N goes high, average waiting time increases as expected, because more thread creates more bursts and the queue becomes busier. Thus, bursts wait longer than lower N values. Colors in the right indicates burst counts for the lines.

Algorithm FCFS:

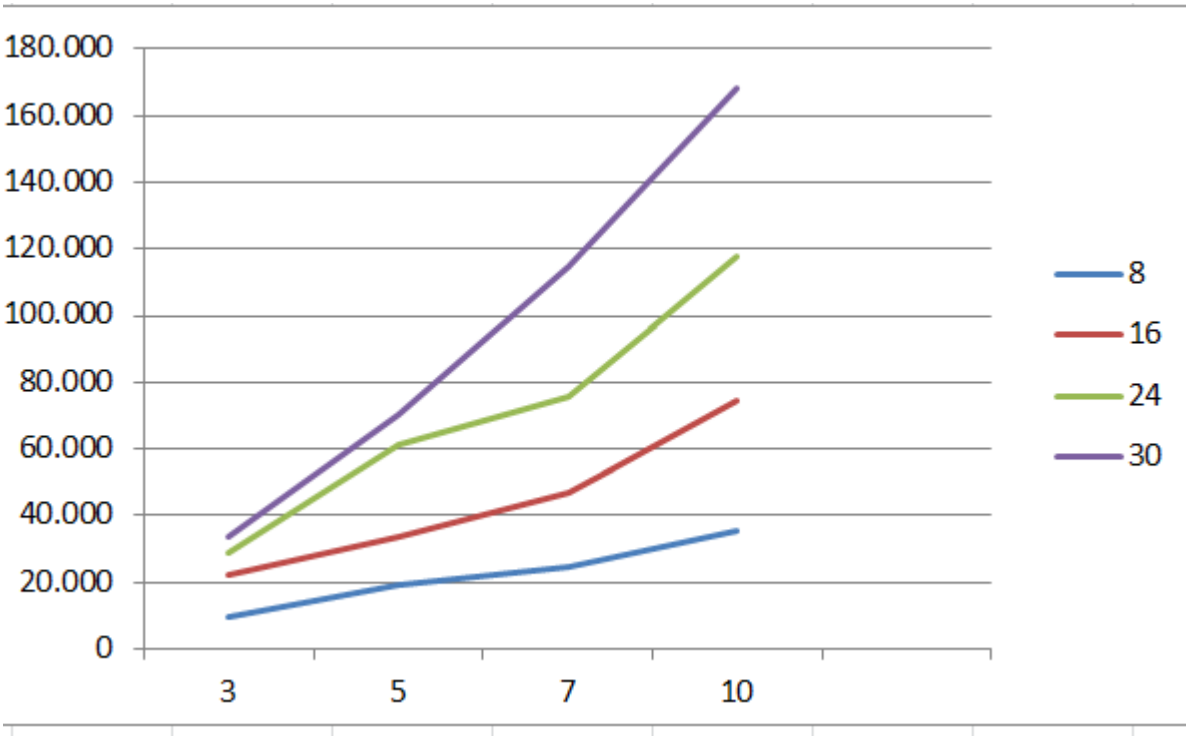

Figure 5: FCFS with different bcount values

The FCFS algorithm's plot is given above. Waiting time increases as bcount value increases because threads create more bursts as the bcount increases, and since the avgA and avgB are constant in this experiment, the queue becomes busier as burst count increases. Thus, average waiting time increases with bcount increasing. It reaches over 160000 ms waiting time with 30 bcount value.

Algorithm PRIO:

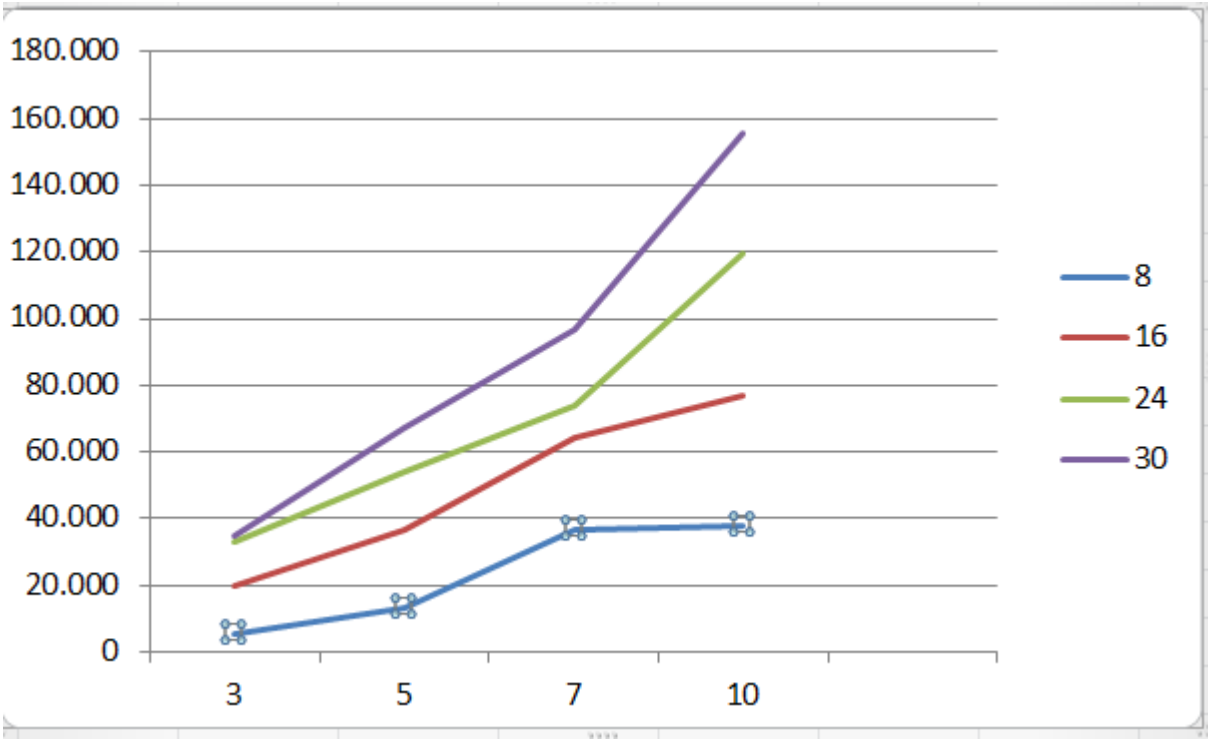

Figure 6: PRIO with different bcount values

Waiting time increases as bcount value increases in the PRIO graph as well. It reaches below 160000 ms waiting time with 30 bcount value. Although the PRIO algorithm has very similar average waiting times with FCFS, PRIO has slightly shorter waiting times.

Algorithm SJF:

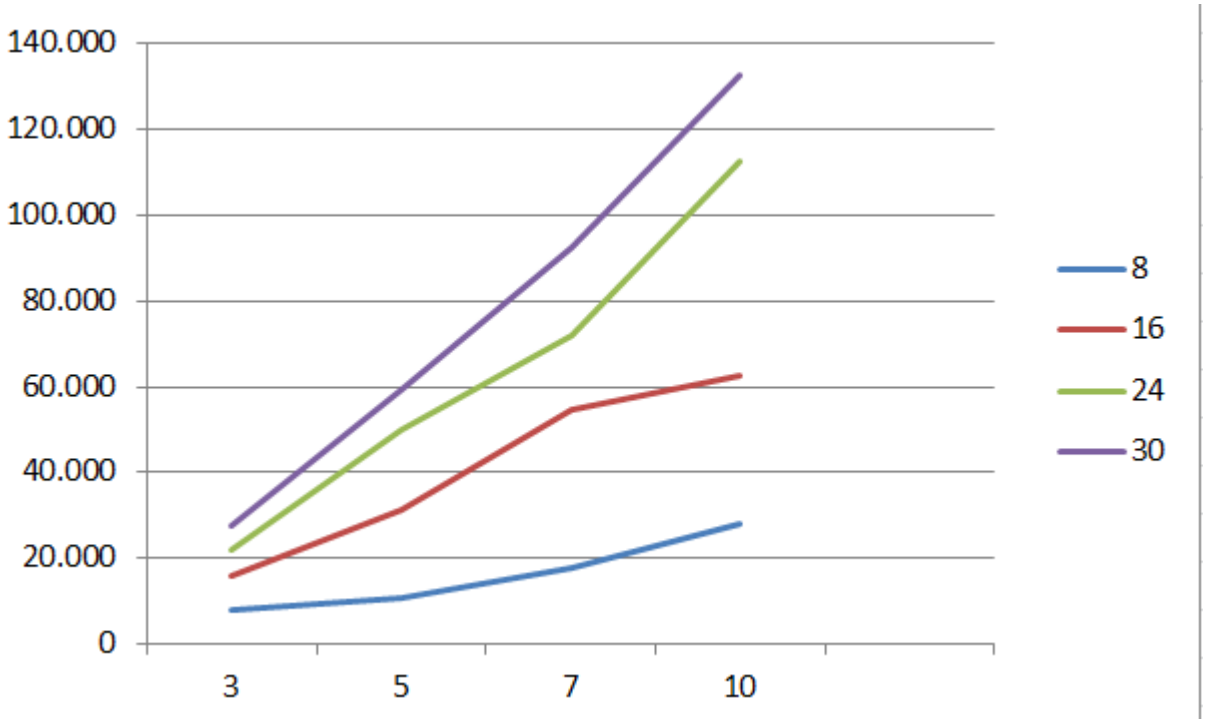

Figure 7: SJF with different bcount values

Waiting time increases as bcount value increases in the SJF graph as well. It reaches below 140000 ms waiting time with 30 bcount value. SJF graph has better average waiting times when compared to FCFS and PRIO. It's performance is the best among all algorithms.

Algorithm VRUNTIME:

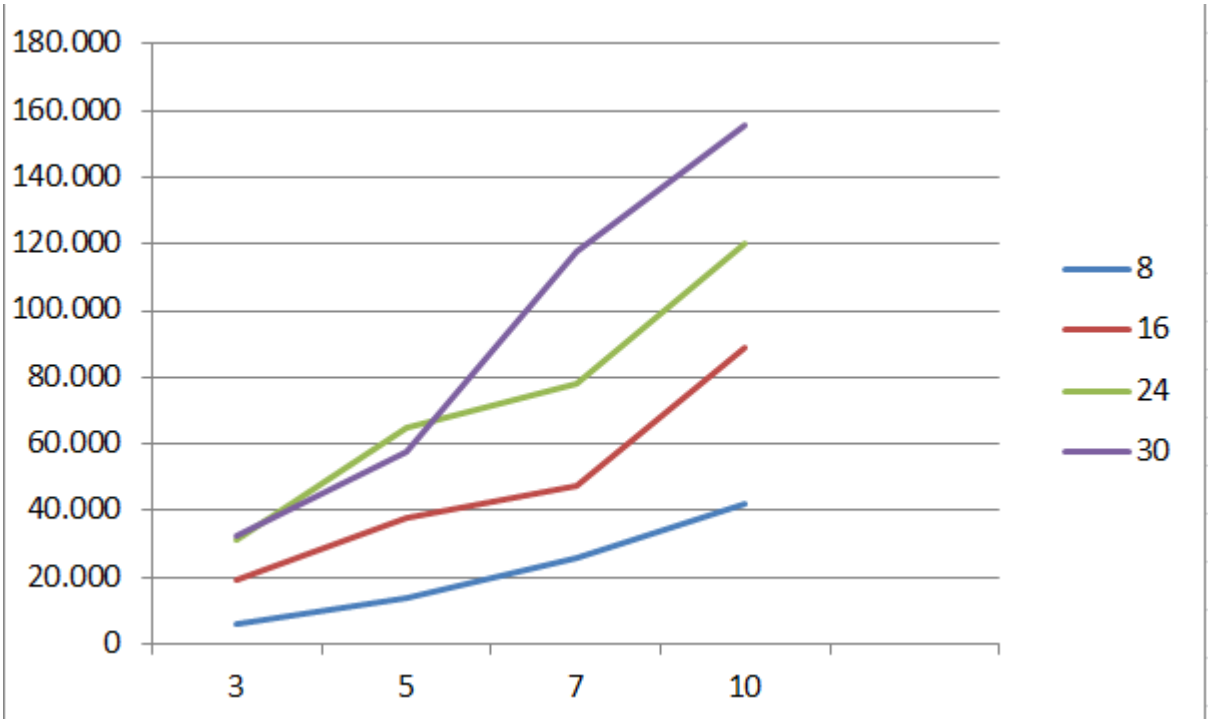

Figure 8: VRUNTIME with different bcount values

Waiting time increases as bcount value increases in the VRUNTIME as well. It reaches below 160000 ms with 30 bcount value. It has a similar graph to FCFS and PRIO, it has lower waiting times than FCFS and almost the same waiting times with PRIO.

Experiment 3

In this experiment, I will only examine SJf algorithm with changing avgB values(300, 900, 1500, 2200) with constant parameters(minA = minB = 100, avgA = 1000, N = 9, bcount = 10)

Graph:

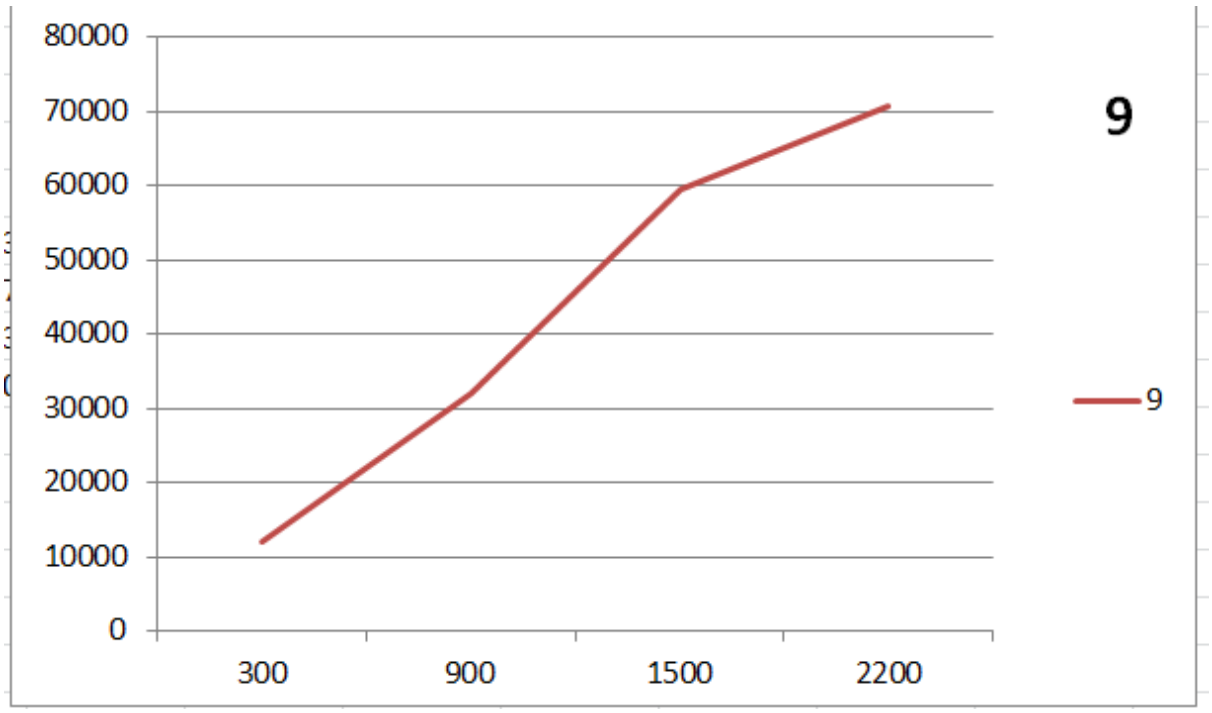

Figure 9: SJF with different avgB values

As seen in the graph, when the avgB value increases, average waiting time is also increasing. That is because burst amounts are increasing, hence the scheduler wastes more time on bursts. Thus, other bursts in the queue are waiting longer than lower avgB values.

VRUNTIME Question:

Below is the average waiting time for threads for some executions with VRUNTIME algorithm.

N=10, bcount = 30, minA= minB= 100, avgA = avgB = 1000

```
Average waiting time for thread 1 : 90201.366667
Average waiting time for thread 2 : 93488.533333
Average waiting time for thread 3 : 159562.466667
Average waiting time for thread 4 : 168803.466667
Average waiting time for thread 5 : 161486.966667
Average waiting time for thread 6 : 165315.866667
Average waiting time for thread 7 : 167321.933333
Average waiting time for thread 8 : 205054.733333
Average waiting time for thread 9 : 178230.466667
Average waiting time for thread 10 : 166913.033333
```

Figure 10: Average waiting times for each thread with specified parameters in VRUNTIME

N=5, bcount = 24, minA= minB= 100, avgA = avgB = 1000

```
Average waiting time for thread 1 : 55252.750000
Average waiting time for thread 2 : 37757.083333
Average waiting time for thread 3 : 36542.000000
Average waiting time for thread 4 : 60412.250000
Average waiting time for thread 5 : 54335.500000
```

Figure 10: Average waiting times for each thread with specified parameters with VRUNTIME

Conclusion

Taking all the results into consideration, from the first experiment I conclude that average waiting time decreases as the avgA value increases but average waiting time increases when bcount value increases. Reasons for these explained above. To compare the scheduling algorithms; SJF by far is the best algorithm for low waiting times in the first two experiments. FCFS, PRIO and VRUNTIME had similar values for waiting times in both experiments but PRIO has the longest average waiting time(11188,5 ms) in experiment with avgA value and FCFS has the longest average waiting time(168265,4 ms) in experiment with bcount value. Experiment 3 shows that increasing avgB value also increases the average waiting time as explained above.

To conclude, SJF is the best scheduling algorithm among others for low average waiting time. bcount and avgB values increases waiting time as they increase and avgA value decreases waiting time as it increases.