

CS 321 – Operating Systems

Spring 2020/2021

Project Assignment

Objectives:

You will be doing a project within the following rules:

- Group of maximum two students.
- Project will be done in three phases.

You will write a complete C program that will utilize the various concepts of Operating Systems:

1. **Reading a scheduling data from a file.**
2. **Create a shared memory of commonly used data.**
3. **Run and compare among selected six scheduling algorithms concurrently.**
4. **Execute each algorithm as thread.**
5. **Each time a job is processed by either of these threads a counter is incremented.**
6. **Implement locking mechanisms on the critical shared data (Mutex).**
7. **Output the results to a file. (See output required)**

Phase 1: (May 3rd 2021)

- Reading scheduling data from a file and implementing three scheduling algorithms.
- Create the shared memory.

Phase 2: (May 31st 2021)

- Implementing the remaining algorithms.
- Create the threads for each of the scheduling algorithms.

Phase 3: (June 21st 2021)

- Implement the locking and synchronization and output the results back to a file.
- Finalizing the project.

Output Required:

You need to output your all your processed data in table format for each algorithm. (Check sample outputs for different scheduling)

1. Average waiting time for each algorithm.
2. Average turnaround time each algorithm.
3. The counter value is displayed whenever it is updated and the ID of the Thread which did the update.

Final Statistics:

4. Total number of processed jobs.
5. Total processing time for sequential execution of these six algorithms.
6. Total processing time for the threaded (Parallel) execution of these six algorithms.

First Come First Serve CPU Scheduling Algorithm (FCFS)

```
Enter The Number of Processes To Execute:      3

Enter The Burst Time of Processes:

Process [1]:20
Process [2]:10
Process [3]:30

Process          Burst Time      Waiting Time      Turnaround Time

Process [1]          20.00          0.00          20.00
Process [2]          10.00          20.00          30.00
Process [3]          30.00          30.00          60.00

Average Waiting Time = 16.666666
Average Turnaround Time = 36.666668
```

Round Robin Scheduling

```
Enter Total Number of Processes:      3

Enter Details of Process[1]
Arrival Time:    0
Burst Time:      20

Enter Details of Process[2]
Arrival Time:    3
Burst Time:      10

Enter Details of Process[3]
Arrival Time:    7
Burst Time:      30

Enter Time Quantum:      2

Process ID          Burst Time      Turnaround Time      Waiting Time

Process[2]          10          25          15
Process[1]          20          44          24
Process[3]          30          53          23

Average Waiting Time:  20.666666
Avg Turnaround Time:  40.666668
```

Shortest Job First Algorithm non-preemptive (SJF)

```
Enter Total Number of Processes:      3
Enter Burst Time For Process[1]:      20
Enter Burst Time For Process[2]:      10
Enter Burst Time For Process[3]:      30

Process ID          Burst Time      Waiting Time      Turnaround Time
Process[2]          10              0                10
Process[1]          20              10               30
Process[3]          30              30               60

Average Waiting Time:  13.333333
Average Turnaround Time:  33.333332
```

Shortest Job First Algorithm preemptive (SJF)

```
Enter the Total Number of Processes:    3

Enter Details of 3 Processes

Enter Arrival Time:      0
Enter Burst Time:        20

Enter Arrival Time:      3
Enter Burst Time:        10

Enter Arrival Time:      7
Enter Burst Time:        30

Average Waiting Time:  11.000000
Average Turnaround Time:  31.000000
```

Priority Scheduling Algorithm non-preemptive

```
Enter Total Number of Processes:      3

Enter Burst Time and Priority For 3 Processes

Process[1]
Process Burst Time:      20
Process Priority:        3

Process[2]
Process Burst Time:      10
Process Priority:        2

Process[3]
Process Burst Time:      30
Process Priority:        1

Process ID      Burst Time      Waiting Time      Turnaround Time
Process[3]      30              0                30
Process[2]      10              30               40
Process[1]      20              40               60

Average Waiting Time:  23.000000
Average Turnaround Time:  43.000000
```

Priority Scheduling Algorithm preemptive

```
Enter Total Number of Processes:      3

Enter Details For Process[A]:
Enter Arrival Time:      0
Enter Burst Time:      20
Enter Priority: 3

Enter Details For Process[B]:
Enter Arrival Time:      3
Enter Burst Time:      10
Enter Priority: 2

Enter Details For Process[C]:
Enter Arrival Time:      7
Enter Burst Time:      30
Enter Priority: 1

Process Name   Arrival Time   Burst Time   Priority   Waiting Time
A              0              20           3          0
B              3              10           2         17
C              7              30           1         23

Average waiting time:  13.333333
Average Turnaround Time:  33.333332
```

Sample input data:

Quantum time: 2

Burst time	Arrival time	Process Priority
20	0	3
10	3	2
30	7	1