CNG 334 – INTRODUCTION TO OPERATING SYSTEMS

ASSIGNMENT 1 REPORT

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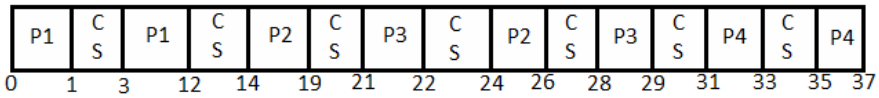
Task 1: Scheduling

1) FCFS:

	ready queue
Time 0	P1->10
Time 3	P1->9 P2->7 P3->2
Time 14	P2-> 7 P3->2 P4->4
Time 21	P3->2 P4->4
Time 24	P2->2 P4->4
Time 28	P3->1 P4->4
Time 31	P4->4
Time 35	P4->2

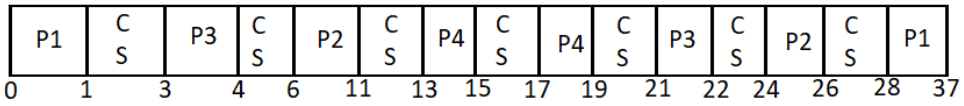


* turnaround time=> exit time-arrival time
P1=>12-0=12
P2=>26-2=24
P3=>29-3=26
P4=>37-13=24
-> avg turnaround time: 86/4=21.5 ms

* waiting time=> turnaround time-burst time
P1=>12-10=2
P2=>24-7=17
P3=>26-2=24
P4=>24-4=20
-> avg waiting time: 63/4=15.75 ms

2) Non-preemptive Priority:

	ready queue
Time 0	P1->10
Time 3	P3->2 P2->7 P1->9
Time 6	P2->7 P1->9
Time 13	P4->4 P3->1 P2->2 P1->9
Time 17	P4->2 P3->1 P2->2 P1->9
Time 21	P3->1 P2->2 P1->9
Time 24	P2->2 P1->9
Time 28	P1->9

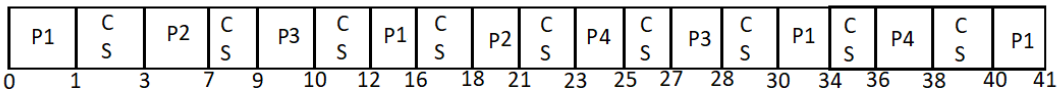


* turnaround time => exit-arrival
P1=>37-0=37
P2=>26-2=24
P3=>22-3=19
P4=>19-13=6
-> avg turnaround time: 86/4=21.5 ms

* waiting => turnaround-burst
P1=>37-10=27
P2=>24-7=17
P3=>19-2=17
P4=>6-4=2
-> avg waiting time: 63/4=15.75 ms

3) RR (quantum=4):

	ready queue
Time 0	P1->10
Time 3	P2->7 P3->2 P1->9
Time 9	P3->2 P1->9
Time 12	P1->9 P2->3 P4->4
Time 18	P2->3 P4->4 P3->1 P1->5
Time 23	P4->4 P3->1 P1->5
Time 27	P3->1 P1->5 P4->2
Time 30	P1->5 P4->2
Time 36	P4->2 P1->1
Time 40	P1->1

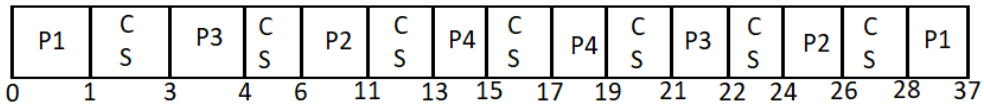


* turnaround time => exit-arrival
  - P1=> 41-0=41
  - P2=> 21-2=19
  - P3=> 28-3=25
  - P4=> 38-13=25
  - -> avg turnaround time: 110/4=27.5 ms

* waiting => turnaround-burst
  - P1=> 41-10=31
  - P2=> 19-7=12
  - P3=> 25-2=23
  - P4=> 25-4=21
  - -> avg waiting time: 87/4=21.75 ms

4) SPN:

	ready queue
Time 0	P1->10
Time 3	P3->2 P2->7 P1->9
Time 6	P2->7 P1->9
Time 13	P3->1 P4->4 P1->9
Time 16	P2->2 P4->4 P1->9
Time 20	P4->4 P1->9
Time 24	P4->2 P1->9
Time 28	P1->9



* turnaround time => exit-arrival
  - P1=>37-0=37
  - P2=> 18-2=16
  - P3=> 14-3=11
  - P4=> 26-13=13
  - -> avg turnaround time: 77/4=19.25 ms

* waiting => turnaround-burst
  - P1=>37-10=27
  - P2=> 16-7=9
  - P3=> 11-2=9
  - P4=> 13-4=9
  - -> avg waiting time: 54/4=13.5 ms

Task 2: Processes and Threads Creation

A) Processes:

1.

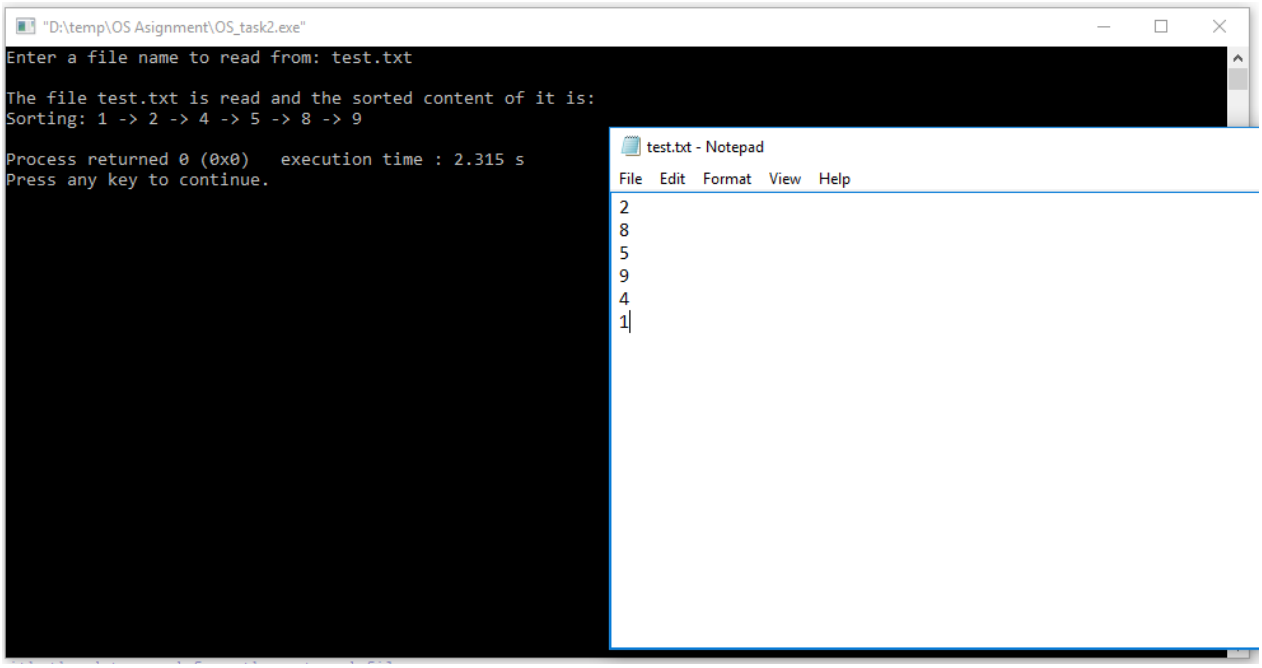


Figure 1: Text File Content and Output for Selection Sort Algorithm

2.

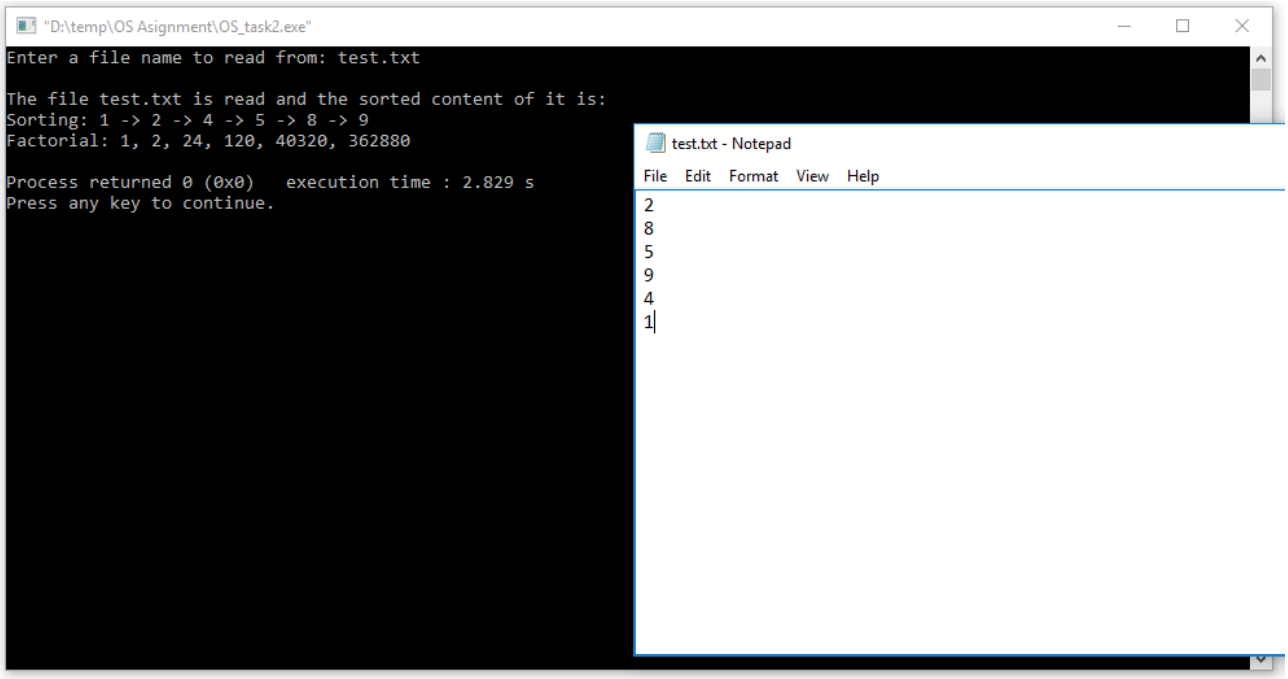


Figure 2: Factorial Values of Sorted Linked List Content

Task 3: Answering Questions

1) ***What is the difference between concurrency and parallelization, and how does multiprogramming increase CPU utilization?***
   - ➔ In concurrency, multiple tasks execute and complete running at the same time by other means, overlapping time periods. However in parallelism, the task(s) is/are divided into multiple sub-tasks and they run simultaneously.
   - ➔ Multiprogramming increase CPU utilization by making sure that CPU always has at least one to execute and it does that by organizing all the available jobs.

2) ***Describe the differences between short-term, medium-term, and long-term scheduling.***

   - ➔ **Short-term scheduling:** It's a CPU scheduler so it is used very often and so it is very fast compared to other two options (long- and medium-term). It does not provide much control over the degree of multiprogramming. It basically selects all processes that are ready to execute from the ready queue in the main memory and allocates CPU to one of them.
   - ➔ **Medium-term scheduling:** It's called as process swapping scheduler because when a process is suspended by a request or a system call and removed from the main memory, it is stored in a swapped queue in the secondary memory to create space for other (further) processes in the main memory.
   - ➔ **Long-term scheduling:** It's known as a job scheduler as it works with low-priority (batch) jobs and selects the next one to be executed by planning the CPU scheduling accordingly. It basically selects the processes/jobs from the secondary disk and loads them into the main memory to be executed. It has the overall control on the degree of multiprogramming and is the slowest one among these three.