CSE 4049: Design of Operating Systems

ASSIGNMENT 2:

This assignment is designed to give you practice with concepts of

- Process scheduling

1. Consider the set of processes with arrival time (in milliseconds), CPU burst time (in milliseconds), and priority (low number implies high priority) as shown below.

Process	Arrival time	Burst Time	Priority
P1	0	10	3
P2	0	1	1
P3	0	2	3
P4	0	1	4
P5	0	5	2

   - Find the average turnaround time, average waiting time and average response time for each of the following scheduling algorithm along with their Gantt chart illustrating the execution of these processes:
     - FCFS, (Consider the order specified in the table)
     - SJF (Non preemptive),
     - SRTF,
     - Non preemptive Priority based scheduling,
     - Preemptive Priority based scheduling,
     - Round robin scheduling (quantum =4ms)
   - Which of the algorithms results in the minimum average waiting time over all processes?
2. Consider the set of processes with arrival time (in milliseconds), CPU burst time (in milliseconds), and priority **(low number implies high priority)** as shown below.

Process	Arrival time	Burst Time	Priority
P1	0	4	3
P2	0	2	1
P3	1	3	2
P4	2	2	4

- Find the average turnaround time, average waiting time and average response time for each of the following scheduling algorithm along with their Gantt chart illustrating the execution of these processes:
    - > FCFS, (Consider the order specified in the table)
    - > SJF (Non preemptive),
    - > SRTF,
    - > Non preemptive Priority based scheduling,
    - > Preemptive Priority based scheduling,
    - > Round robin scheduling (quantum =2ms)
- Which of the algorithms results in the minimum average waiting time over all processes?

3. Consider the set of processes with arrival time (in milliseconds), CPU burst time (in milliseconds), and priority (**high number implies high priority**) as shown below.

Process	Arrival time	Burst Time	Priority
P1	0	11	1
P2	0	8	0
P3	12	2	3
P4	2	6	2
P5	9	16	4

- Find the average turnaround time, average waiting time and average response time for each of the following scheduling algorithm along with their Gantt chart illustrating the execution of these processes:
    - > FCFS, (Consider the order specified in the table)
    - > SJF (Non preemptive),
    - > SRTF,
    - > Non preemptive Priority based scheduling,
    - > Preemptive Priority based scheduling,
    - > Round robin scheduling (quantum =5ms)
- Which of the algorithms results in the minimum average waiting time over all processes?

4. Consider a multilevel feedback queue scheduling (MLFBQ) with three queues q1, q2 and q3. q1 and q2 use round-robin algorithm with time quantum equal to 3 and 5milliseconds respectively. q3 uses first-come first-serve algorithm. Assume the arrival time of all processes as 0. A process entering the ready queue will put in queue 0. Processes in queue q1, q2 will be demoted to lower priority queue, if not completed on specified time quantum. Find the average waiting time (A.W.T) and average turnaround time (A.T.A.T) for executing the following process?

Processes	Burst time
P1	8
P2	22
P3	4
P4	12

5. Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.
6. Consider the following four processes with arrival times (in milliseconds) and their length of CPU bursts (in milliseconds) as shown below:

Process	Arrival time	Burst Time
P1	0	3
P2	1	1
P3	3	3
P4	4	x

   Find the value of x, such that the average waiting time of the processes is 1 millisecond, if the processes execute on a single processor using SRTF scheduling.
7. How the base time quantum is related to the static priority? Find the base time quantum for the processes having highest, lowest and default static priority.
8. What will be the dynamic priority of the following processes?

Process	**Static Priority**	**Average Sleep time**
P1	110	250ms
P2	120	700ms
P3	132	1s

9. What will be the minimum average sleep time for a process, so that the following processes will be considered as an interactive process by the scheduler in Linux System?

Process	**Static Priority**
P1	130
P2	108
P3	124
P4	132

10. Which of the following processes can not be considered as an interactive process by the scheduler in Linux System?

Process	**Static Priority**
P1	136
P2	104
P3	116