CSCE 451/851 Homework 3

Assigned: Apr 5, 2020
Due: Apr 19, 2020 23:59:59
Submit: Upload to Canvas as PDF
100 points total

Problem 1 (40 points)

Consider the following set of processes:

Process Name	Arrival Time	Processing Time
A	0	3
B	1	5
C	3	2
D	9	5
E	12	5

Perform FCFS, RR $(q = 4)$, SPN, SRT, on them and get the Finish Time and Turnaround Time for each process. For reference:

- FCFS: First Come First Served
- RR: Round Robin
- SPN: Shortest Process Next
- SRT: Shortest Remaining Time Next

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
FCFS																				
RR																				
SPN																				
SRT																				

Problem 2 (20 points)

Consider a computer with two processes, `H`, with high priority, and `L`, with low priority. The scheduling rules are such that `H` is run whenever it is in ready state. At a certain moment, with `L` in its critical region, `H` becomes ready to run (e.g., an I/O operation completes). `H` now begins busy waiting, but since `L` is never scheduled with `H` is running, `L` never gets the chance to leave its critical region, so `H` loops forever. This situation is sometimes referred to as the priority inversion problem.

If instead of priority scheduling, we use round-robin scheduling, will we encounter the same problem? Please explain your answer in detail.

Problem 3 (40 points)

Based on measurements, we know for a certain system the average process runs for a time X before blocking on I/O. It takes a time Y to do a process switch, which is effectively wasted (overhead). For round-robin scheduling with quantum Q, give a formula for the CPU efficiency for each of the following:

- $Q = \infty$

- $Q > X$
- $Y < Q < X$
- $Q = Y$
- $Q \longrightarrow 0, Q \neq 0$

NOTE: The CPU efficiency is the useful CPU time divided by the total CPU time.