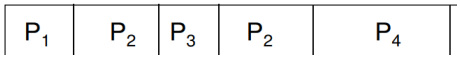
Operating Systems (2020 Fall, Grad Level)
Question Sheet

1. [U4][15 pts] The stack segment and data segment of a process are generally not allowed to be executed. In addition, its code segment is not allowed to be written. Explain why.
2. [U5] [15 pts] Consider the scheduling result of preemptive Shortest-Job First algorithm (a.k.a. Shortest Remaining Time First).

Process	Arrival Time	Bu
P1	0.0	7
P2	2.0	4
P3	4.0	1
P4	5.0	4

SJF (preemptive)



Show the state transitions of processes P2 and P3:

- At time 4: P2 is preempted by P3.
- At time 5: P3 completes and P2 resumes execution.

3. [U6] [15 pts] In general, Buddy System runs much faster than Best Fit, but the first allocation failure will occur much earlier with Buddy System. Explain why (both points).
4. [U7] [15 pts] Why it is difficult to implement shared memory with inverted page tables? Propose a solution to this problem.
5. [ps1][10 pts] Explain what is the priority inversion problem and how it is managed in lottery scheduling.
6. [ps2][10 pts] If two processes frequently contend for the same cache line then they will suffer from severe performance degradation. Explain why. Now, a potential solution is to run the two processes on the same core, but this solution may also introduce some problems. Show one of them.
7. [ps3][10 pts] In the Linux process scheduling hierarchy, there exist overlaps among groups of NUMA nodes. Why not to partition the NUMA nodes into disjoint groups?
8. [ps4][10 pts] Although EDF achieves the best result of schedulability, RM is used more often in real system implementation. Give two reasons for that.