**Assignment 2**

**Due**: 11:55PM Sept. 18, 2023

**Submission**: Complete your submission on Blackboard.

Email submission will NOT be accepted. If you cannot complete the assignment before the deadline due to Covid-19, you must contact the instructor **BEFORE** the deadline. Otherwise, **late submission will NOT be accepted**.

**Total points**: 20 points

1. In single batch systems, the following hardware components are needed:

* Memory Protection
* Privileged Instructions
* Timer
* Interrupt

Use your words to explain why each of the above hardware components is needed. (10 points)

The timer is important because it prevents a single job from monopolizing system resources. The interrupt is important because it allows for better transfer of control from the monitor to user programs. Memory protection is important to prevent a user program from overwriting the monitor. Privileged instructions are important because they’re instructions that only the monitor can perform, this prevents user programs from having access to things that they shouldn’t.

2.

JOB1 JOB2 JOB3

Type of job Heavy compute Heavy I/O Heavy I/O

Duration 5 min. 5 min. 5 min.

Memory required 50M 100M 80 M

Need disk? No No Yes

Need terminal No Yes No

Need printer? No No Yes

In the single batch system, three jobs are completed in the order of job1, job2 and job 3.

In multiprogramming, there is little resource contention between the jobs, so all three can start at the same time while coexisting with the others in the computer.

A paper with writing on it

Description automatically generatedCalculate the total elapsed time, throughput rate (jobs/hour) and mean response time in both single batch system and multiprogrammed batch system. (10 points)

A paper with writing on it

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END