CS 314 Operating Systems
Summer 2023
Quiz #1 on May 16, 2023 (Suggested Solutions)

Your Last Three Digits: ________________
(please do NOT write all of your student ID or your name)

Grade: ______

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(1) What is “extended machine”? This question does not ask how we can use extended machine. A definition of “extended machine” is needed.

The term, “extended machine”, means imaginary computer systems that can be manipulated by “high level commands“, which is theoretically impossible to have without an operating system. It is because none of the hardware components in a computer system understands any high level commands issued by human users. However, by having an operating system on top of computer hardware, such a computer system can be manipulated even by high level commands with the help from an operating system. Today, virtually all (decent) computer systems are “extended machine”.

(2) What are “multi-tasking systems”?

Multi-taking is a way computer systems execute computer programs in such a way that (1) a processor executes one program at a time, but a computer system provides human users (2) an illusion of multiple computer programs seemingly running all at a time, when (3) a processor switches execution of computer programs in extremely short time intervals (e.g., 1/100 of a second each).

(3) What is “context switching”?

As also covered in CS286, context-switching is the act of switching a processor from one program to another (the program a processor is switched away will stop running and the program a processor is witched to will start running).
(4) Briefly describe what problem in “pre operating system” a batch system fixes and how.

The batch system was introduced to **eliminate the problem of “attending a computer system” in “pre operating systems”**. Since the program loader automatically starts the next program in the “user program buffer after a previous program finishes running (the batch system also automatically saves the outputs of each program as soon as one finishes running). Thus, using a batch system, human (computer) users are no longer required to attend a computer system while a computer system is executing the user’s programs.

(5) What problem in “batch system” do “multi-programming (multitasking) OSees” fix and how?

**Poor CPU utilization** in batch systems will be improved by the multitasking OS, by having many programs ready in the memory. **Processor switches to another when one has to be stopped** (i.e., when the currently running processor can not use a processor).