CS 314-002 Operating Systems  
Spring 2020  
Quiz #3 on February 4, 2020 (SOLUTIONS)

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

Grade: ______

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(1) In the following sentence: “The long-term scheduler is the main component that controls ________ in multitasking operating systems”, fill out the blank by a phrase (sorry, it’s not a “word”) that best fits to the blank.

“the degree of multi-tasking”

(2) What is “the short-term process scheduling”?

The short-term process scheduling is the act of assigning a processor to one of the processes in the ready-state.

Note: “loading processes to the main memory for execution” is not an acceptable solution (because it is the long-term scheduling that loads new processes to memory (“New” state)).

(3) How is “Blocked” state in the short-term process scheduling different from “Blocked” state in the long-term process scheduling?

The blocked-state in the short-term process scheduling: it is the state (or a group of processes) processes in the short-term scheduling are unable to use a processor (they are mostly unable because they are waiting for response from an I/O device).

The blocked-state in the long-term process scheduling: it is the state (or a group of processes) processes in the long-term scheduling are not handed to the short-term scheduling because the long-term scheduler finds that the computer system currently does not have enough resources (processor or memory), especially when thrashing is happening.

Note: for full credit, the “blocked state” of both the short-term process scheduling and the long-term process scheduling should be described to contrast how the two blocked states are different.
(4) What is “the medium-term process scheduling”?

The medium-term scheduling is the scheduling (a) when “the degree or multi-tasking” is out of control (thrashing or memory-shortage is happening, or “there is no longer enough system resources”) after the long-term scheduling accepts processes. To perform the task, the medium-term scheduler removes some processes (those that are likely contributing to thrashing or memory shortage) (b) from the short-term scheduling to the blocked state in the long-term scheduling.

Note 1:

(a) **When the medium-term scheduling takes place** (when “the degree or multi-tasking” is out of control (thrashing or memory-shortage is happening, or “there is no longer enough system resources”)) should be mentioned.

(b) **Where processes are moved** (i.e., “from the short-term scheduling” and “to the blocked state in the long-term scheduling (or “out of the main memory”)) should be mentioned.

Note 2:

The medium-term scheduling does NOT move processes that do not receive the resource they demand. Processes are, by default, demanding, requesting as much resource as they wish to have (thus, it is almost always impossible to satisfy all the requirements from each processes). Instead, the job of the medium-term scheduling is to make sure that the computer system has enough resource to execute processes reasonably well (in such a way that thrashing does not happen).

(5) Show a sketch of the integration of the short-term, medium-term, and long-term process scheduling as a directed state-transition diagram.

![Three Different Layers of Process Scheduling](image.png)

**Note:** relatively heavy penalties for serious errors (such as “blocked from running” and “running from blocked (in the long-term scheduling)