Fundamental of Computer Science

Homework Set 4

November 15, 2023

1. (4.5') Summarize the **booting** procedure by filling the blanks with proper words given. Please fill an uppercase letter in each underline (e.g., We all know that __D__ is the full name of OS).

A. volatile main memory	B. mass storage	C. ROM
D. operating system	E. bootloader	

1) The CPU begins executing the __E__ which resides in __C__

2) The __E__ directs the CPU to load the __D__ from __B__ to __A__

3) When the __D__ has been loaded, __E__ transfers control to __D__

2. (2') Suppose a multiprogramming operating system does **not** terminate a process performing I/O operation. Each time slice is 50 ms. It normally takes 17 ms to position the disk's read/write head over the desired track and another 8 ms to rotate for the desired data. How much of a time slice can be spent waiting for a read operation (from a disk to take place)? If the machine is capable of executing ten instructions each microsecond (μs), how many instructions can be executed during this waiting period? For question 1, fill a percentage in the form (e.g., 20%). For question 2, fill an integer in the form (e.g., 100).

	Question 1	**Question 2**
Answer	**50%**	**250000**

3. (1.5') A process is said to be I/O-bound if it requires a lot of I/O operations, whereas a process that consists of mostly computations within the CPU/memory system is compute-bound. If a compute-bound process and an I/O-bound process are both waiting for a time slice, which should be given priority? (OS could terminate a process performing I/O operation and allow another process to run while the first is waiting.)

Fill an uppercase letter in the form.

A. I/O-bound process B. compute-bound process

Which should be given priority?	A

4. (2') Suppose each time slice in a multiprogramming system is 50 ms and each context switch requires 1 μs.

a) What fraction of the machine's time is spent actually performing compute-bound processes?

b) What would this fraction be if each process executes an I/O request a microsecond (μs) after its time slice begins? (Assume OS terminates a process performing I/O operation and allows another process to run while the first is waiting.)

Fill a fraction in the form (e.g., 100/101, use '/' to separate two integers without spaces).

	a)	b)
Answer	50000/50001	49998/50001