

Question 1. [6 MARKS]

Each of the following statements is false. In one sentence, explain why. (If you disagree that the statement is false, provide your reasoning.)

Part (a) [1 MARK] A trap instruction is a privileged operation.

Part (b) [1 MARK]

Locks and semaphores are identical structures.

Part (c) [1 MARK]

If two threads access a shared variable at the same time, there will be a concurrency error.

Part (d) [1 MARK]

Limited direct execution means that once the OS has prepared a process for execution, the process has full control of the CPU.

Part (e) [1 MARK]

Indexed-based file systems suffer from external fragmentation because blocks of the file may be scattered across the disk.

Part (f) [1 MARK]

Extent-based file systems may require more disk block accesses than indexed-based files systems for random access because it may need to traverse an extent to get to a particular byte in the file.

Question 2. [7 MARKS]**Part (a)** [3 MARKS]

Name 3 fields stored in the data structure used to keep track of processes in the kernel.

Part (b) [2 MARKS]

Describe what state needs to be saved for a process during a context switch.

Part (c) [2 MARKS]

Give one concrete example of how the operating system virtualizes the hardware resources that we have seen so far in the course. Identify which resource is virtualized and how the operating system achieves this virtualization.