



Name: \_\_\_\_\_ **Solution** \_\_\_\_\_

ID: \_\_\_\_\_

**ABET outcome (e) Ability to identify, formulate and solve engineering problems.**

1. Which of the following instructions should be privileged and which can be performed in user mode?

- |                              |               |
|------------------------------|---------------|
| a. Set value of timer.       | <b>kernel</b> |
| b. Read the clock.           | <b>user</b>   |
| c. Clear memory.             | <b>Kernel</b> |
| d. Issue a trap instruction. | <b>user</b>   |

2.

a. Why caches are useful. What problems do they solve?

**Caches solve the transfer problem by providing a buffer of intermediate speed between the components. If the fast device finds the data it needs in the cache, it need not wait for the slower device.**

b. What problems do caches cause?

**The data in the cache must be kept consistent with the data in the components. If a component has a data value change, and the datum is also in the cache, the cache must also be updated. This is especially a problem on multiprocessor systems where more than one process may be accessing a datum.**

c. If a cache can be made as large as the device for which it is caching (for instance, a cache as large as a disk), why not make it that large and eliminate the device?

**A component may be eliminated by an equal-sized cache, but only if:**

- a) **the cache and the component have equivalent state-saving capacity (that is, if the component retains its data when electricity is removed, the cache must retain data as well), and**
- b) **the cache is affordable, because faster storage tends to be more expensive.**

3. What are the three major activities of an operating system with regard to memory management?

**The three major activities are:**

- a) **Keep track of which parts of memory are currently being used and by whom.**
- b) **Decide which processes are to be loaded into memory when memory space becomes available.**
- c) **Allocate and deallocate memory space as needed.**