

Ceng 328 Operating Systems
Final
Aug 14, 2009 11.00–13.00
Good Luck!

Answer all of the questions.

1. (15 pts) What is time sharing? Describe the concept of the multiprogramming level. What is meant by the term context switch? What might cause a context switch to occur?
2. (10 pts) Compare briefly system calls and library functions. Describe how system calls work. On UNIX, which of the following are considered system calls?
 - `read()`, `printf()`, `malloc()`, `open()`
3. (10 pts) A mechanism that can be used for synchronization is the ability to turn on and off interrupts.
 - i How can you use this to implement a critical section?
 - ii Why does it work?
 - iii Why is this generally a bad idea?
4. (15 pts) Where on a disk should the disk directories be physically located? What is the essential difference between a block special file and a character special file? Explain what hard and symbolic links are.
5. (15 pts) Explain the UNIX index node structure in detail.
6. (15 pts) What is meant by memory-mapped I/O? How might devices be protected from uncontrolled access? Describe how I/O might be programmed with and without interrupts enabled.
7. (15 pts) What is deadlock? What is the difference between a deadlocked and an unsafe state? Describe four ways to prevent deadlock by attacking the conditions required for deadlock. Is it possible to attack to these conditions and prevent deadlock?
8. (15 pts) A computer has six tape drives, with n processes competing for them. Each process may need two drives. For which value of n is the system deadlock free?