

CS162 Spring 2005 Final review questions (for Spring 2007)

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1. What are the advantages of user threads over kernel threads?

What are the advantages of kernel threads over user threads?

2. What are the advantages of running more programs concurrently?

What are the disadvantages of running more programs concurrently?

What are the challenges of running many programs concurrently, and how are they solved?

3. How is preemptive multiprogramming implemented - i.e., how can the OS regain execution control when it is not executing?

4. How does one create a new process in Unix?

5. What is the difference between an open system and a closed system?

Is cory.EECS.Berkeley.EDU an open system or closed system; why?

6. What are the different (basic) scheduling algorithms we covered in class?

Which of these are preemptive?

Which of these have a maximum quantum?

If you had omniscient knowledge about the job queue, and could preempt, which scheduling algorithm is the best?

If you had omniscient knowledge about the job queue, and could NOT preempt, which scheduling algorithm is the best?

7. Give an example of a function, which if run twice concurrently, without synchronization, can give incorrect results.

8. Which atomic (hardware) instruction can be used to implement a semaphore?

Bonus: implement semaphores using this atomic instruction.

9. Of counting semaphores and binary locks, which is more powerful (or neither), and why?

10. Let's model concurrency in an exam using synchronization variables. We have 100 students, 2 TAs, and 1 professor.

When a student arrives he should:

- (a) Wait until he receives an exam
- (b) Print "writing name"
- (c) Wait until the teacher says to start the test
- (d) Print "taking test"
- (e) Wait until the teacher says to stop the test
- (f) Hand in the test
- (g) Exit

A TA should:

- (a) Hand out 50 exams

A teacher should:

- (a) Wait until 100 students are ready (have written their names)
- (b) Announce the start of the test
- (c) Sleep for 90 minutes
- (d) Wait until 100 students have handed in the test

Fill in the code below. Explicit locking is not needed for condition variables. Your solution must work no matter what order people arrive in the room.

```
examHandout = new _____
examHandin = new _____
studentReady = new _____
testStart = new _____
testStop = new _____

Student() {
    examHandout._____
    println("writing name");
    studentReady._____
    testStart._____
    println("taking test");
    testStop._____
    examHandin._____
}
TA() {
    repeat 50 {
        examHandout._____
    }
}
Professor() {
    repeat 100 {
        studentReady._____
    }

    testStart._____
    waitUntil(90*60);
    testStop._____

    repeat 100 {
        examHandin._____
    }
}
```

11. What is a spin-lock?

Why would you want to use one instead of a heavy-duty lock?

Why would you NOT want to use one?

12. State the four conditions of deadlock and for each, explain how the condition is met during a traffic gridlock.

When a traffic gridlock is resolved, which condition has changed (explain)?

13. With a clean cache/TLB, how many physical memory accesses does it take to read a byte from memory, in base and bounds, segmentation, paging?

With a clean cache/TLB, how many physical memory access does it take to read 10240 bytes from memory, in base and bounds, segmentation, paging?

Assume: for segmentation: size of segment is 1 MB. For paging: size of page is 1 KB.

14. Suppose you have a disk with lots of 1 MB files, 25% of which are fully fragmented, and the other 75% are fully contiguous.

How long does it take to mirror the entire disk onto another disk?

How long does it take to copy the files in the file system to a file system on an empty disk?

15. How is the Unix file system organized (inodes)?

16. How are hierarchical directory implemented in Unix?

17. If you are using AOL instant messenger, is latency or bandwidth more important? When is the other more important?

18. What does the transport layer do? Describe a transport protocol.

19. What does the network layer do?

20. What is the difference between circuit switching and packet switching?

Is a telephone connection a circuit or packet-switched?

Is an IP connection a circuit or packet-switched?

What are the advantages of a packet-switched network?

What are the advantages of a circuit-switched network?

21. Explain access control lists and capability lists, and give real life examples of each.

22. What do you do during authentication? What is an example of authentication failure?

What do you do during authorization determination? What is an example of authorization failure?

23. What is the confinement problem?

What makes it hard to solve?

24. What are the advantages of asymmetric encryption over symmetric encryption?

What are the advantages of symmetric encryption?

How do you use both asymmetric encryption and symmetric encryption to get the advantages of both?

