1. Assume that you are trying to download a large 2-GB file from the Internet. The file is available from a set of mirror servers, each of which can deliver a subset of the file's bytes; assume that a given request specifies the starting and ending bytes of the file. Explain how you might use threads to improve the download time.
   - We can increase the speed by using threads to use for the multiple servers. The more threads there are it can also become a bottleneck.

2. What is the biggest advantage of implementing threads in user space? What is the biggest disadvantage?
   - We can make it more efficient. We do not need to use traps to switch to different threads. The disadvantage is that only 1 thread is stuck so will the entire process.

3. Does Peterson's solution to the mutual-exclusion problem shown in Fig. 2-24 of MOS4e work when process scheduling is preemptive? How about when it is nonpreemptive?
   - It is preemptive. If it were not preemptive it might not work.If process 1 goes before process 1 it will run forever and fail.

4. The producer-consumer problem can be extended to a system with multiple producers and consumers that write (or read) to (from) one shared buffer. Assume that each producer and consumer runs in its own thread. Will the solution presented in Fig. 2-28 of MOS4e, using semaphores, work for this system?
   - It will work,Only 1 consumer can add an item to the buffer.

5. How could an operating system that can disable interrupts implement semaphores?
   - First disrupts interrupts, then reads.if the semaphore is zero. It will block off some processes. If some processes are blocked it will choose 1 process to run. If the

6. A fast-food restaurant has four kinds of employees:
   (a) order takers, who take customers' orders;
   (b) cooks, who prepare the food;
   (c) packaging specialists, who stuff the food into bags; and
   (d) cashiers, who give the bags to customers and take their money.

   Each employee can be regarded as a communicating sequential process. What form of interprocess communication do they use? Relate this model to processes in UNIX.
   - Each worker speaks only to one other workers much like processes/

7. Five jobs are waiting to be run. Their expected run times are 9, 6, 3, 5, and x. In what order should they be run to minimize average response time? (Your answer will depend on x).
We should run by the fastest process first.

8. The aging algorithm with a = 1/2 is being used to predict run times. The previous four runs, from oldest to most recent, are 40, 20, 40, and 15 msec. What is the prediction of the next time? Explain.
-The sequence is 40, 30, 35, and 25.

9. In the dining philosophers problem, let the following protocol be used: An even-numbered philosopher always picks up his left fork before picking up his right fork; an odd-numbered

philosopher always picks up his right fork before picking up his left fork. Will this protocol guarantee deadlock-free operation? Why or why not?
If we follow the process at least one person will eat therefore it will not end in a deadlock.

10. The readers and writers problem can be formulated in several ways with regard to which category of processes can be started when. Carefully describe three different variations of the problem, each one favoring (or not favoring) some category of processes. For each variation, specify what happens when a reader or a writer becomes ready to access the database, and what happens when a process is finished.
Reader has priority. If a writer finished and there is a reader in queue, run that first before any writer.