

This exam is **closed book**. You can have **one page** of notes. Be specific.  
UH expels cheaters.

1. Find the *single sentence* that applies best to each property: (10×3 points)  
(Hint: Several of the choices offered are *plain wrong*.)

<i>Main disadvantage of microkernels</i>	__f__
<i>Main disadvantage of master-slave organization</i>	__g__
<i>Main advantage of dual-mode CPUs</i>	__l__
<i>Main disadvantage of modular kernels</i>	__h__
<i>Main disadvantage of delayed writes</i>	__i__
<i>Main disadvantage of layered kernel organizations</i>	__n__
<i>Main advantage of memory protection</i>	__m__
<i>Main disadvantage of monolithic kernels</i>	__e__
<i>Main advantage of DMA controllers</i>	__a__
<i>Main advantage of timer interrupts</i>	__k__

- a) Allow faster data transfers between the main memory and the disk.
  - b) Allow system users to add new features to the OS without recompiling the kernel.
  - c) Allow user processes direct access to the disk drive.
  - d) Are faster than other kernel organizations.
  - e) Are hard to maintain.
  - f) Are slower than other kernel organizations.
  - g) Introduces a potential bottleneck in the computer system.
  - h) Make the kernel much less reliable.
  - i) May result in lost data whenever a process crashes.
  - j) Minimize the number of context switches required to process a system call.
  - k) Prevent processes from monopolizing the CPU.
  - l) Prevent user processes from executing I/O instructions.
  - m) Prevents user processes from modifying the kernel.
  - n) Very difficult to find the right decomposition of kernel tasks.
2. Why was it so important for computer scientists to have access to the source code of UNIX? (10 points)
- It gave them the opportunity to investigate, understand and modify the OS.

3. Give one example of

a) A real-time process with hard deadlines? (5 points)

The instrument landing system of an airplane\_\_\_\_\_

b) A real-time process with soft deadlines ( 5 points)

A DVD player\_\_\_\_\_

4. How many lines will the following program print out? (5 points)

```
main() {  
    printf("Hi!\n");  
    fork();  
    printf("How are you?\n");  
    fork();  
    printf("See you!\n");  
} // main
```

The program will print out exactly   7   lines.

5. Assuming that we are *doubling the size* of the main memory of a computer system with two CPUs, should we expect to see less or more processes

a) In the *running state*? (5 points if you can justify answer; 2 points otherwise)

A small increase—say from 1.4 to 1.6—is possible because there will probably be more processes in the ready state.

b) In the *ready state*? (5 points if you can justify answer; 2 points otherwise)

There should be more processes in the ready state as the main memory will be able to contain more processes.

c) In either of the two *suspended states*? (5 points if you can justify answer; 2 points otherwise)

There should be fewer processes in either of the two suspended states as the main memory will be able to contain more processes.

6. Are all *timesharing systems* also *interactive systems*? (5 points) Justify your answer. (5 points) Is the reverse true? (5 points) Justify your answer (5 points)

All timesharing systems are interactive systems because their users share interactive time on the computer. Many interactive systems are not timesharing systems because an interactive system can also a single-user systems.

7. Which are the two states that can be reached by a process *leaving the waiting state* and which events or actions may occasion these transitions? (2×5 points)

A process leaving the waiting state can go (a) to the *ready state* after the completion of the request that put it in the waiting state or (b) to the *waiting-suspended* state if the process is swapped out.