HW 01   CS345 Operating Systems   Chapter 1 & parts of 12

<u>**Problems:**</u>

1. (2) What is multiprogramming and what is it used for?

2. (2) What are some advantages of multiprocessor systems?

Increased throughput - more work done in less time
Economy of scale - Because they can share resources the can cost less
Increased reliability - properly distributed tasks over several processes can fail and allow other processors to pick up the remaining tasks, graceful degradation

3. (3) How do clustered systems differ from multiprocessor systems?

Clustered systems involve multiple computers whereas a multiprocessor system involves one computer, but that computer has multiple processors.

What is required for two machines belonging to a cluster to cooperate to provide a highly available service?

4. (3) Why are caches useful.

What problems do caches cause?

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? Provide any assumptions or conditions that your answer is based on.

5. **(3) Indicate which following types of operating systems, Time sharing (T), Real time (R), Handheld (H) match with the following properties:**

T   R   H   Uses CPU scheduling and multiprogramming to provide interactive use of a system for many users.

T   R   H - An operating system used for a few dedicated end-user applications.

T   R   H - The CPU switches rapidly from one user to another.

T   R   H - Reads information from sensors and must respond in a fixed amount of time.

T   R   H - Often found as part of the control system for a device or system.

T   R   H - An operating system for a device with a small amount of memory, small display and often, a slow processor.

6. **(3) What is the purpose of interrupts?**

What are the differences between a trap and an interrupt?

Can traps be generated intentionally by a user program? If so, for what purpose?

7. **(2) What are the advantages and disadvantages of using memory-mapped I/O to access device control registers?**

8. **(4) Consider a hypothetical microprocessor having a 16-bit word size (for example, assume that the program counter and the address registers are 16 bits wide).**

    a. **What is the maximum memory, in Kbytes, that the processor can access directly if it is connected to a "16-bit wide memory" with a 16-bit data bus? [Hint: Stated another way, every time a read is done from RAM, the RAM delivers 16 bits, or 2 bytes of data.]**

    b. **What is the maximum memory, in Kbytes that the processor can access directly if it is connected to an "8-bit wide memory" with a 8-bit wide data bus?**

    c. **What architectural features will allow this microprocessor to access a separate "I/O space" (it would have a memory space and I/O space)?**

    d. **If separate input and output instructions can each specify which I/O port (usually there is one device for each I/O port) to select using an 8-bit I/O port number, how many I/O ports can the microprocessor support if the data path**

(data buss) to each I/O port is 8 bits wide? How many I/O ports can the microprocessor support if the data path is 16 bits wide? Explain.

The format of the instruction might be like:

Bits indicating an IO instruction.	Register to read/write from/to	R/W	Port # that is 8 bits

9. **(2) In virtually all systems that include DMA modules, DMA access to main memory is given higher priority than processor access to main memory. Why?**