1. What are the two main functions of an operating system?

   It's a operating system job is to manage input device or io devices and system resources

2. What is the difference between time sharing and multiprogramming systems?

   Time sharing is when multiple users use a computer system at the sametime. While multiprogramming is have the computer is a single computer system in process that are simultaneous

3. The family-of-computers idea was introduced in the 1960s with the IBM System/360 mainframes. Is this idea now dead as a doornail or does it live on?
   - It is still relevant today. They are all architecturally compatible and have generations where they can work on different models.
4. What is the difference between kernel and user mode? Explain how having two distinct modes aids in designing an operating system. z
   - Kernel mode can use every instruction and use every feature. IT has the highest privilege. User mode and can only use a portion of instructions. This way each user can only do a certain amount of instructions without having access to critical information.
5. On early computers, every byte of data read or written was handled by the CPU (i.e., there was no DMA). What implications does this have for multiprogramming?

   -Without DMA the cpu would only do I/O related tasks and the cpu would always be busy since I/O is usually the bottleneck for the system.

6. There are several design goals in building an operating system, for example, resource utilization, timeliness, robustness, and so on. Give an example of two design goals that may contradict one another.
   - We want the process to run somewhat at the same time so that everything is working at the same speed. But we also want faster processing stuff to be closer to the front of the line so that that doesn't hold up the queue of instructions.
7. Which of the following instructions should be allowed only in kernel mode? (a) Disable all interrupts. (b) Read the time-of-day clock. (c) Set the time-of-day clock. (d) Change the memory map.

   Disable all interrupts, set the time of day clock and change the memory map.

8. Consider a system that has two CPUs, each CPU having two threads (hyperthreading). Suppose three programs, P0, P1, and P2, are started with run times of 5, 10 and 20 msec, respectively. How long will it take to complete the execution of these programs? Assume that all three programs are 100% CPU bound, do not block during execution, and do not change CPUs once assigned.

   It will take 20, 25 , 30 msec. If all of the 3 are cued on the same cpu then it will take 35 seconds.

   -

9. What is a trap instruction? Explain its use in operating systems.
   - A trap instruction is an instruction from user to kernel mode.
10. Modern operating systems decouple a process address space from the machine's physical memory. List two advantages of this design.

- It allows programs to use memory from 2 different locations and