DEPARTMENT OF COMPUTER ENGINEERING
UNIVERSITY OF PERADENIYA

CO327: Operating Systems - 2020

April 1, 2020

Assignment 1:

1. We have stressed the need for an operating system to make efficient use of the computing hardware. When is it appropriate for the operating system to forsake this principle and to "waste" resources? Why is such a system not really wasteful?

2. What is the main difficulty that a programmer must overcome in writing an operating system for a real-time environment?

3. How does the distinction between kernel mode and user mode function as a rudimentary form of protection (security) system?

4. Some early computers protected the operating system by placing it in a memory partition that could not be modified by either the user job or the operating system itself. Describe two difficulties that you think could arise with such a scheme.

5. Give two reasons why caches are useful. What problems do they solve? What problems do they 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?

6. In a multiprogramming and time-sharing environment, several users share the system simultaneously. This situation can result in various security problems.

   a) What are two such problems?

   b) Can we ensure the same degree of security in a time-shared machine as in a dedicated machine? Explain your answer.

7. Describe the differences between symmetric and asymmetric multiprocessing. What are three advantages and one disadvantage of multiprocessor systems?

8. How are network computers different from traditional personal computers? Describe some usage scenarios in which it is advantageous to use network computers.

9. What is the purpose of interrupts? How does an interrupt differ from a trap? Can traps be generated intentionally by a user program? If so, for what purpose?

10. Direct memory access is used for high-speed I/O devices in order to avoid increasing the CPU's execution load.

    a) How does the CPU interface with the device to coordinate the transfer?

    b) How does the CPU know when the memory operations are complete?

    c) The CPU is allowed to execute other programs while the DMA controller is transferring data. Does this process interfere with the execution of the user programs? If so, describe what forms of interference are caused.

11. Some computer systems do not provide a privileged mode of operation in hardware. Is it possible to construct a secure operating system for these computer systems? Give arguments both that it is and that it is not possible.

12. Many SMP systems have different levels of caches; one level is local to each processing core, and another level is shared among all processing cores. Why are caching systems designed this way?

13. Describe a mechanism for enforcing memory protection in order to prevent a program from modifying the memory associated with other programs.

14. Identify several advantages and several disadvantages of open-source operating systems. Include the types of people who would find each aspect to be an advantage or a disadvantage.

Please make your answers as succinct as possible.

DEADLINE: 06:00 pm on Tuesday, April 21, 2020