OS Principles

2.1 OPERATING SYSTEM OBJECTIVES AND FUNCTIONS

1. What are the areas of services provided by the OS? Describe briefly 3 of those.
2. What is the OS kernel? Where is it saved?
3. What are the resources managed by OS?

2.2 THE EVOLUTION OF OPERATING SYSTEMS

4. Why are two modes (user and kernel) needed?
5. What is time slicing?
6. Define the essential properties of the following types of systems:
    a. Serial
    b. Batch
    c. Multiprogramming
    d. Time-sharing
    e. Real-time

7. In a batch operating system, three jobs are submitted for execution. Each job involves an I/O activity, CPU time, and another I/O activity of the same time span as the first. Job JOB1 requires a total of 23 ms, with 3 ms CPU time; JOB2 requires a total time of 29 ms with 5 ms CPU time; JOB3 requires a total time of 14 ms with 4 ms CPU time. Illustrate their execution and find CPU utilization for uniprogramming and multiprogramming systems.

2.3 MAJOR ACHIEVEMENTS

8. With many jobs running at the same time, Errors are very hard to be reproduced, due to the absence of some systematic means of coordination and cooperation among activities, describe the main 4 types of such errors.

9. What are the main 3 components of a process?
10. List and briefly explain five storage management responsibilities of a typical OS.
11. What 3 factors must be considered by any resource allocation and scheduling policy.

12. Suppose we have four jobs in a computer system, in the order JOB1, JOB2, JOB3and JOB4. JOB1 requires 8 s of CPU time and 8 s of I/O time; JOB2 requires 4 s of CPU time and 14 s of disk time; JOB3 requires 6 s of CPU time; and, JOB4 requires 4 s of CPU time and 16 s of printer time. Define the following quantities for system utilization:
    - Turnaround time = actual time to complete a job
    - Throughput = the average number of jobs completed per time period T
    - Processor utilization = percentage of time that the processor is active (not waiting)

    Compute these quantities (with illustrations if needed) in each of the following systems:

    a. A uniprogramming system, whereby each job executes to completion before the next job can start its execution.
    b. A multiprogramming system that follows a simple round-robin scheduling. Each process gets 2 s of CPU time turn-wise in a circular manner

2.4 DEVELOPMENTS LEADING TO MODERN OPERATING SYSTEMS

13. Explain the difference between a monolithic kernel and a microkernel.

14. Distinguish between multiprogramming and multiprocessing. What are the key motivations for the development of each?

2.5 FAULT TOLERANCE

15. Describe 2 techniques used by OS to support fault tolerance.

2.6 OS DESIGN CONSIDERATIONS FOR MULTIPROCESSOR AND MULTICORE

16. Describe 2 ways of extracting parallelism from computing workloads.