

COS Questions – Lecture 2

Operating System Concepts (Tenth Edition)

Threads & Concurrency

4.1 Provide three programming examples in which multithreading provides better performance than a single-threaded solution.

4.2 Using Amdahl's Law, calculate the speedup gain of an application that has a 60 percent parallel component for (a) two processing cores and (b) four processing cores.

4.3 What are two key differences between user-level threads and kernel-level threads?

4.4 Which of the following are shared across threads in a multithreaded process?

- a. Register values
- b. Heap memory
- c. Global variables
- d. Stack memory

4.5 Is it possible to have concurrency but not parallelism? Explain.

4.6 Determine if the following problems exhibit task or data parallelism.

- Using a separate thread to generate a thumbnail for each photo in a collection.
- Transposing a matrix in parallel.
- A networked application where one thread reads from the network and another thread writes to the network.

4.7 Given the following code segment, how many unique processes are created? How many unique threads are created?

```
pid_t pid;

pid = fork();
if (pid == 0) { /* child process */
    fork();
    thread_create( . . . );
}
fork();
```

CPU Scheduling

5.1 What is the difference between an CPU burst and I/O burst?

5.2 What is the role of a CPU scheduler? Why is it necessary?

5.3 What is the difference between preemptive and non-preemptive scheduling?

5.4 What is the role of the dispatcher? What is the difference between a voluntary and nonvoluntary context switch?

5.5 What are the five criteria (parameters) for evaluation of CPU scheduling algorithms?

5.6 What is starvation? Which of the following algorithms could result in starvation? How can starvation be resolved?

- a. First-come, first-served
- b. Shortest job first
- c. Round robin
- d. Priority

5.7. What advantage is there in having different time-quantum sizes at different levels of a multilevel queueing system?

5.8 What is the difference between symmetric multiprocessing (SMP) and asymmetric multiprocessing?

5.9 How can threads (ready queues) be organized on multiprocessor processors?

5.10 What is memory stall? How do modern processors resolve this issue?

5.11 What is load balancing? What are the two general approaches to achieve it?

5.12 What is processor affinity? What are the two types?

5.13 What are the two types of real-time scheduling? How are they different?

5.14 What is event latency? What two types of latencies affect the performance of real-time systems?