

# CS 4210

Quiz  
May 22, 2003

Student Name:

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1. Which of the following benefits does multi-threaded programming provide (Circle all that apply)
  - a. Multi-threading always simplifies application development and maintenance.
  - b. Multi-threading helps the programmer expose potential concurrency within a single process to the runtime system.
  - c. The multi-threading library (e.g., Pthreads) automatically partitions a sequential, non-threaded program into a multi-threaded program.
  - d. Multi-threading helps exploit concurrency within a single process when the process is executed in a multi-processor environment.
  - e. Multi-threading can potentially simplify application development and maintenance.
  - f. Multi-threading can help overlap communication with computation within a single process.
  
2. Circle all that apply: Unsynchronized access (e.g., by *not* using any mutexes) by threads to shared data:
  - a. can always be used to circumvent locking for very small data items (e.g., a single integer variable) on all hardware/software platforms
  - b. can be used in a synchronization-cost optimization technique in some special cases (e.g., variables that change values exactly once during program execution)
  - c. can always be used provided there are never more than two threads concurrently executing in the process at any given time.
  
3. The Birrell (1989) paper used in class, on introduction to threads, is from the following institution:
  - a. DIGITAL Systems Research Center
  - b. IBM T.J. Watson Research Center
  - c. SUN Microsystems Research Center