Study Guide for Final Exam

Final exam is scheduled at 7:00 PM - 9:00 PM (evening) in Berthoud Hall 241 on December 13 (Wednesday), 2017.

Chapter 5. Concurrency: Mutual Exclusion and Synchronization

Be able to define:
- race condition
- atomic operation
- critical section
- mutual exclusion
- deadlock
- starvation
- spin lock / busy waiting
- semaphores (counting vs binary, strong vs weak)
- monitor

Understand:
- concurrency (in single and multi-processor systems)
- nondeterministic order of process execution
- requirements and hardware support for mutual exclusion
- how semaphores and mutex locks work
- wait() (i.e., P operation) and signal() (i.e., V operation)
- using semaphores to enforce mutual exclusion or synchronization
- bounded and unbounded-buffer producer-consumer problems + solutions
- how deadlock can arise from improper mutex or synchronization

Chapter 6. Concurrency: Deadlock

Be able to define:
- deadlock
- conditions for deadlock
- mutual exclusion
- hold-and-wait condition
- preemption
- circular wait
- deadlock prevention
- deadlock avoidance
- deadlock detection
safe state

Understand:
- resource allocation graphs
- necessary and sufficient conditions of deadlock
- attacking hold and wait
- attacking circular wait
- determining safe state
- banker’s algorithm

Chapter 7. Memory Management

Be able to define:
- page
- frame
- page table
- relocation
- internal fragmentation
- external fragmentation
- compaction
- logical address
- relative address
- physical address
- address space
- simple paging
- simple segmentation

Understand:
- requirements of memory management
- fixed partitioning + benefits and drawbacks
- dynamic partitioning + benefits and drawbacks
- paging + benefits and drawbacks
- placement algorithms (best fit, next fit, first fit)
- logical to physical address translation
- components of a memory address (offset, page #, ⋅⋅⋅)
- buddy system

Chapter 8. Virtual Memory

Be able to define:
• swapping
• virtual memory
• virtual address
• virtual address space
• resident set
• page fault
• thrashing
• TLB
• fetch policy
• replacement policy
• working set
• Belady’s anomaly

Understand:
• benefits of virtual memory
• page table structure
• additional fields (e.g., presence bit) in page table using virtual memory vs not
• multilevel page tables
• inverted page tables
• considerations for choosing a good page size
• access pattern with page table and TLB (+ EAT calculation impacts)
• OPT, LRU, and FIFO replacement policies
• resident set
• replacement scope
• combination of allocation and replacement
• cleaning policy: demanding cleaning and precleaning