Study Guide for Final Exam

Final exam is scheduled at 3:15 PM - 5:15 PM in BBW 250 (classroom) on December 13 (Thursday), 2018.

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
- necessary and sufficient conditions of deadlock
- mutual exclusion
- hold-and-wait condition
- preemption
- circular wait
- deadlock prevention
- deadlock avoidance
- deadlock detection
• safe state

Understand:
• resource allocation graphs
• 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

Homework Assignments 5-7

In-Class Problems from Chapters 5-8