The Final

3 hours
8–10 problems
Closed book
Simple calculators are OK, but unnecessary
One double-sided 8.5 × 11” sheet of your own notes
Anything discussed in class after the midterm is fair game
Much like homework assignments
Problems will range from easy to difficult; do the easy ones first.
Historical developments & trivia will not be on the test.
MIPS Architecture/Assembly programming
- Computational, Load/Store, & Control-flow Instrs.
- Instruction Encoding
- Pseudoinstructions
- Higher-level constructs; subroutines and recursion

MIPS Microarchitecture/Datapaths
- Single-Cycle
  - The datapath for lw, sw, R-type, and branch
  - The controller: instruction decoding
  - Processor Performance
- Multi-cycle
  - Constructing the datapath
  - The FSM controller
  - Performance Analysis
- Pipelined
  - Basic pipelined datapath and control
  - Hazards: forwarding, stalling, and flushing
  - Performance Analysis
The Memory Hierarchy: Caches
- Memory hierarchy to make it fast & cheap
- Temporal and Spatial Locality
- Memory performance; hit rate
- Direct-mapped caches
- $n$-way set associative caches
- Fully associative caches