Fundamentals of Computer Systems
Review for the Final

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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