CS250: Computer Architecture

Midterm Review

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Grading

• 10%: Written assignments (equally weighted, lowest score dropped)
• 33%: Labs (equally weighted, lowest score dropped)
• 16%: Midterm Exam
• 5%: Project 1
• 12%: Project 2
• 22%: Final Exam
• 2%: Evaluation of instructors based on in-class/lab contributions, discussions, and overall performance
Digital Hardware

- Transistors, RTL and TTL logic
  - Recognize/construct basic gates
- Gates
  - And/or/xor/not
  - Schematic representation
  - Multi-input and/or
- Flip-Flops
  - Recognize/understand feedback circuits
  - Construct simple circuits (e.g., S-R latch)

Digital Logic

- Truth Table
  - Karnaugh Map
- Boolean Algebra
  - Basic properties
  - DeMorgan’s Theorem
- Understanding Feedback / Clocked Circuits
Data Representation

- Binary, Hex, Decimal
- Integer Representations
  - Unsigned
  - Approaches to signed
  - Implications for arithmetic
- Character Representations
  - ASCII chart might be handy
- IEEE Floating Point
  - \(<\text{sign}> \times 2^{<\text{8 bit exponent}>-127} \times 1.<\text{23-bit mantissa}>\)
- Recognizing in Memory Dump

Processor Organization

- Von Neumann Architecture
  - Processor/memory
  - Stored Program Computer
- CPU
  - Register / ALU / controller
  - Microcode
  - Processor modes / protection
CPU

- ALU
  - Operations
- Registers
  - Banks, windows, special purpose
- Instruction processing
  - Fetch/Execute Cycle
  - Pipelines
- Instruction Set
  - Arithmetic, Logical, Memory, Control Flow, Floating Point, Processor Control

Assembly Language

- Instruction format
  - [Label:]
  - Instruction
  - Operands
    - Register, Immediate, Memory
- Addressing Modes
  - Specified vs. Computed
  - Register / Register+offset
  - Direct vs. Indirect
Assembly Language (cont.)

• Flow of control
  – Branch vs. jump
  – Conditional branches and condition codes

• Subroutines
  – Argument passing
  – Function results
  – Return address handling

Assembly Language (cont.)

• Data
  – Data vs. code sections
  – Alignment issues

• Macros
Memory

- Types of memory / hardware issues
  - Static vs. dynamic ram
  - Performance characteristics
- Addressing
  - Processor vs. Memory word
  - How this affects alignment
- Memory Controller
  - Banks / interleaving

Midterm Hints

- Open Book / Open Note
  - No electronic aids
- Time will be tight
  - You won’t be able to look everything up – need to know it
    - Don’t get stuck – do what you know well first!
- If something doesn’t make sense, speak up
- Read last year’s midterm at the web site