C335
Computer Structures

Mid Term Exam #2 Review

Dr. Liqiang Zhang

Department of Computer and Information Sciences

Introduction to Logic Design

- Boolean Algebra, Switching Algebra
- Gates, logic equations, truth table
- Properties of Boolean Algebra
  - Axioms, single-variable, two & three variable
  - De Morgan's theorem (memorize)
- Induction proof
- Canonical forms: Minterm and Maxterm
- The triangle relationship of …
- Design of half adder, full adder
- Multiplexor, decoder

ALU Design

- One-bit ALU → 4-bit ALU
- Subtraction? Overflow? Zero detection?
- Ripple Carry adder
  - Disadvantages?
  - Enhancement?
    - Carry Select Header
    - Carry Lookahead
- Multiply
  - Three versions
  - Booth's algorithm
- Divide (basic idea?)
  - Three versions

CPU Design

- Strategy: break up into stages
  - How many? Do what in each?
  - CPU clocking
- Single-cycle datapath CPU design
  - Introduction of sequential logic
    - Latch and flip-flop
    - Other examples of sate elements: register, register file, memory
  - Our implementation
    - Edge-trigged methodology
    - Typical execution
    - Stage-by-stage, instruction-by-instruction
    - Multiplexor insertion
    - timing

CPU Design

- Single-cycle datapath CPU design
  - Control unit design
    - Two level design
      - ALU control – how to?
      - Main control – how to?
  - Disadvantages of single-cycle design?
- Multi-cycle datapath CPU design