Midterm I Review

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Great Ideas

- Abstraction
- Moore’s Law (his prediction indeed)
- Make the common case fast (Amdahl’s Law)
- Pinciple of locality (memory hierarchy)
- Parallelism
- Performance measurement & improvement
- Dependability via redundancy

Everything in Bits

- Unsigned integer
- Signed integer
  - Sign-magnitude
  - One’s complement
  - Two’s complement
- IEEE 754 floating-point number
  - Arithmetic: add & mult

The C language

- How it works
  - Preprocess, compile, link and run
- Variable: types and declaration
- Expression: operators
- Function

Memory Management in C

- Memory and pointers
- Structures
- Array
- Array/Pointer Duality
- Pointer arithmetic
- Stack
- Heap

RISC-V

- Concepts: registers, load-store, endianness, immediate, …
- Basic syntax
- Instruction types: R, I, S, B, J, U
- Control: conditional, loop
- Calling convention:
  - Caller-saved vs. callee-saved
  - Stack frame management
- Instruction encoding/decoding

CALL

- Compiler
- Assembler: directive, pseudo, label, symbol, etc.
- Linker: relocation, ref resolution
- Loader

Combinational

- Boolean algebra
- Basic gates: AND, OR, NOT, NAND, NOR, XOR, XNOR
- Sum of minterms
- Laws of Boolean algebra (De Morgan!)

Stateful

- Registers
- Combinational + Registers
- FSM: Moore vs. Mealy
- Timing: setup time, max freq. est.

Datapath

- The FSM example
- Useful blocks: multiplexer, memory, etc.
- Typical scenario for R-, I-, …, type

Pipeline

- 5 stages: IF, ID, EX, MEM, WB
- Hazards: structural, data, control
- Solution: stall, delay slot, code scheduling, forwarding