What does the Midterm Cover?

- Mano Chapters 1-3
  - anything from lectures
  - material from the homework
- What's not on this Midterm?
  - anything after Chapter 3.
  - floating point representation

Logic and Gates

- Logic Gates
  - AND, NAND, OR, NOR, XOR, NXOR, NOT, BUFFER
    - symbols for gates
    - truth tables
  - Boolean Algebra
    - Identities
      - don't forget correct in book x + yz = (x+y)(x+z)
    - Sum of products form
    - Product of sums form
  - K-Maps
    - 2, 3, and 4 variable forms
    - can get sum of products or product of sums out
    - don't care conditions

Flip-Flops

- add state and time to circuits
- characteristic tables
  - S-R (hazard state)
  - J-K (improve S-R)
  - D (simple storage)
  - T (toggle)
- Clocks
  - never gate the clock

Sequential Circuits

- Combinational logic plus flip-flops
- Representations
  - State tables
  - State Diagrams (graphs)
  - Circuit diagram
  - should be able to convert between any form
- Always have output as a function of just the current state when designing circuits

Digital Building Blocks

- Adder
  - three input, two output circuit
- Decoders
  - n to 2^n
- Encoders
  - 2^n to n
- Multiplexors
  - n control lines
  - 2^n inputs
  - 1 output

Digital Building Blocks with State

- Registers
  - n bits of storage
  - load line
  - tri-state outputs
- Shift Registers
  - shift left or right
  - parallel load
- Binary Counters
  - enable line
  - load
  - clear
  - count up or down

Memory

- collect of cells to store 0's and 1's
- cells have a fixed number of bits (called a word)
  - meaning of what is stored in a word depends on situation
  - 8 bits are a byte
- each memory word is assigned a specific address
- There are several types of memory
  - RAM (Random Access Memory) - read/write
  - ROM (Read Only Memory)
- Read Only memory comes in several types
  - ROM (wired at factory)
  - PROM (write once memory)
  - EPROM (erasable PROM)
  - EEPROM (electronically erasable PROM)

Data Representation

- how to represent letters
  - assign a bit pattern to each character
  - most common way is ASCII
  - 7 bits are enough for the alphabet, numbers, and punctuation
- representing negative numbers
  - Can use signed magnitude
  - Complements
    - 1's complement (flip all the bits)
    - 2's complement (flip all the bits and add one)
- Limited space to represent numbers
  - can have overflow
    - detect overflow for signed and unsigned numbers