Chapter 4: Gates and Circuits

Circuits as Memory – Ch. 4.5

- sequential circuit:
    - a circuit whose output is a function of input values <u>and</u> the current state of the circuit
- example of a sequential circuit: S-R latch
    - the output X is what the S-R latch "remembers"
    - as long as both S and R are at 1, X will hold its value (0 or 1)
    - to set X to 1, change S to 0 (for a moment), keep R at 1
    - to reset X to 0, keep S at 1, change R to 0 (for a moment)

Initial State:
As long as R=1 and S=1, X will hold its value (either 0 or 1)

X	Y	R	S		X	Y	R	S
1	0	1	1		0	1	1	1

to change X to 1, change S to 0 (for a moment), keep R at 1

	X	Y	R	S		X	Y	R	S
before:	1	0	1	0		0	1	1	0
after:	1	0	1	0		1	0	1	0

now change S back to 1 (no change to X and Y)

	X	Y	R	S		X	Y	R	S
before:	1	0	1	1		1	0	1	1
after:	1	0	1	1		1	0	1	1

to change X to 0, keep S to 1, change R at 0 (for a moment)

	X	Y	R	S		X	Y	R	S
before:	1	0	0	1		0	1	0	1
after:	0	1	0	1		0	1	0	1

now change R back to 1 (no change to X and Y)

	X	Y	R	S		X	Y	R	S
before:	0	1	1	1		0	1	1	1
after:	0	1	1	1		0	1	1	1
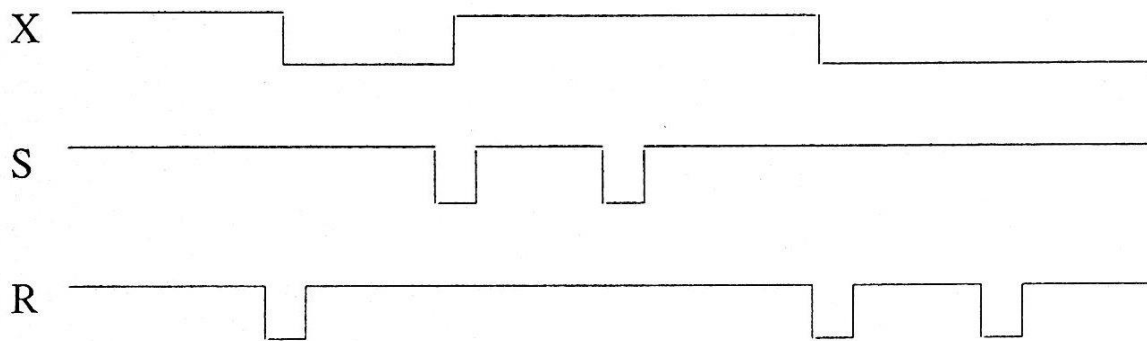
- not covered by textbook
  - latch leads to flip-flop
  - useful for controlling parts of instruction cycle (ch. 5)
  - X is output, S is input, R is control line, fired on clock pulse

Integrated circuit – Ch. 4.6

- piece of silicon on which multiple gates have been embedded

CPU chip – Ch. 4.7

- integrated circuit containing everything needed to implement the Central Processing Unit (CPU)
- component architecture