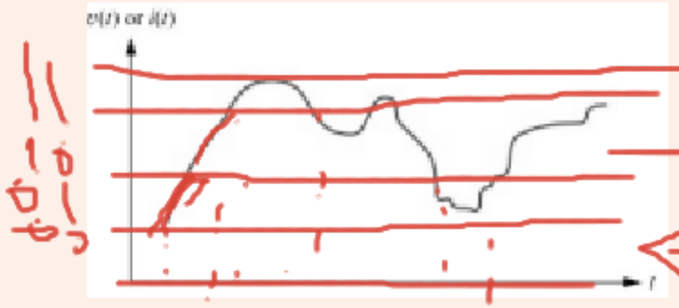
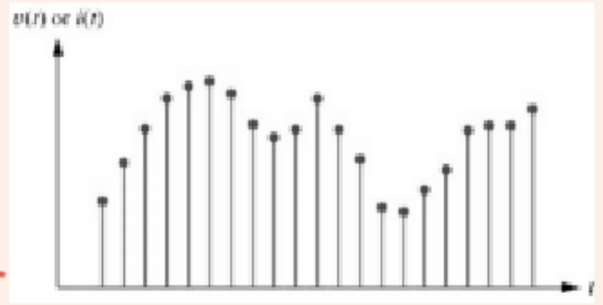
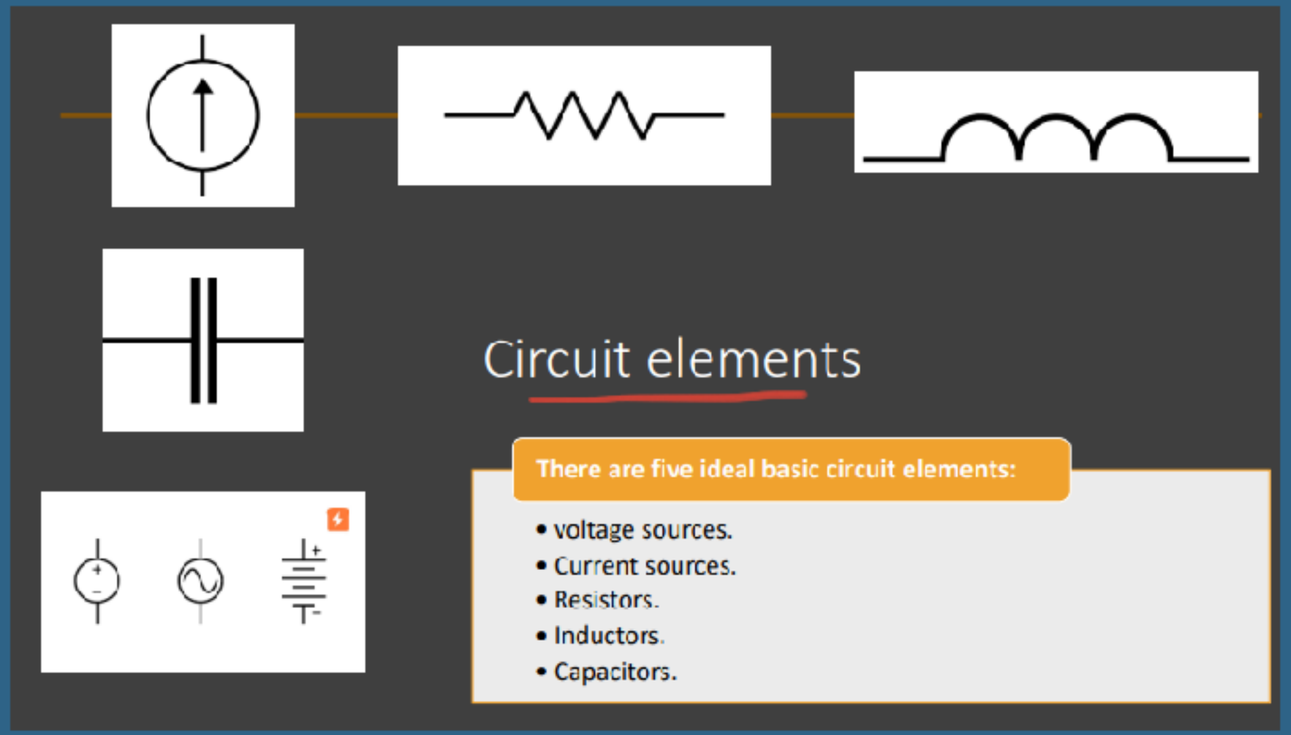
Analog Vs Digital

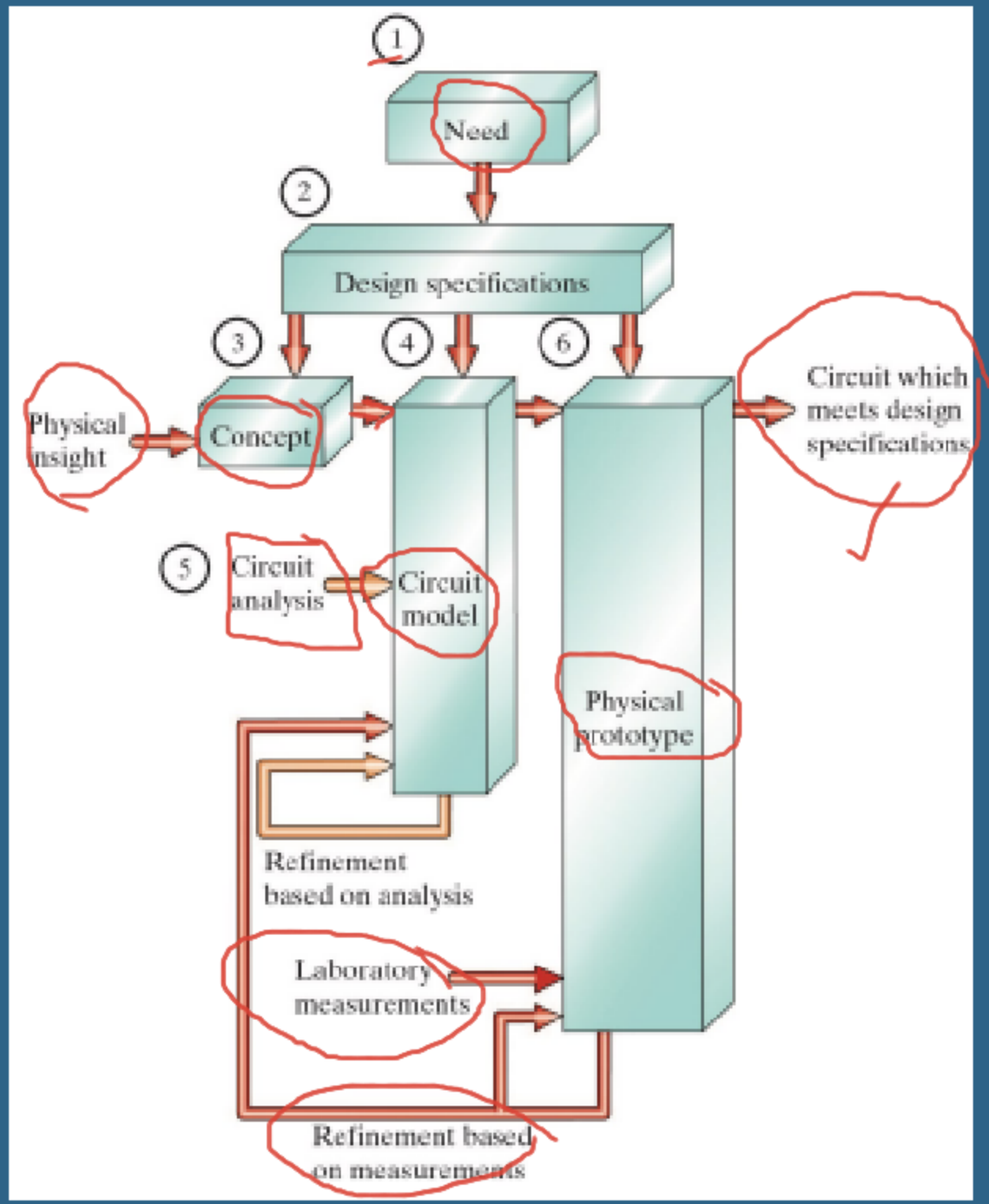
Analog	Digital
Analog devices and systems process time-varying signals that can take on any value across a continuous range of voltage or current.	**Digital Circuits and Systems** process digital signals that of only two* discrete values, which may call Binary: Zeros (0) and ones(1).





Circuit Analysis Review





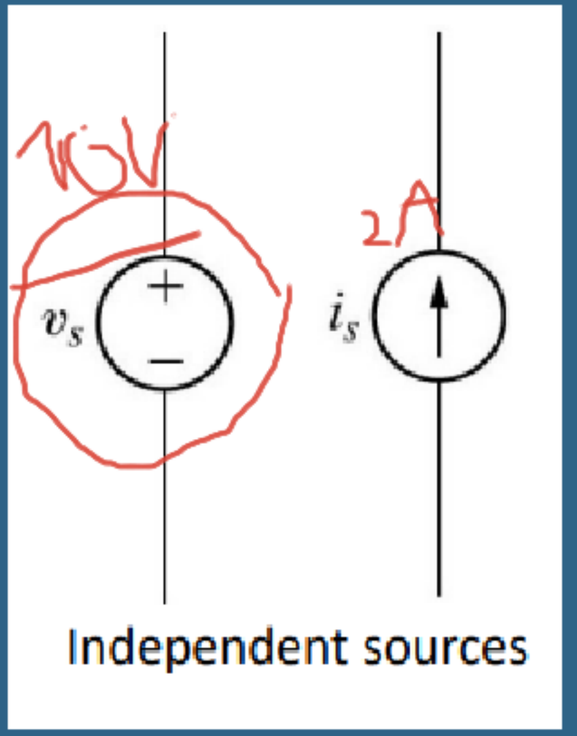
Voltage and Current Sources

Voltage is the pressure from an electrical circuit's power source that pushes charged electrons (current) through a conducting loop.

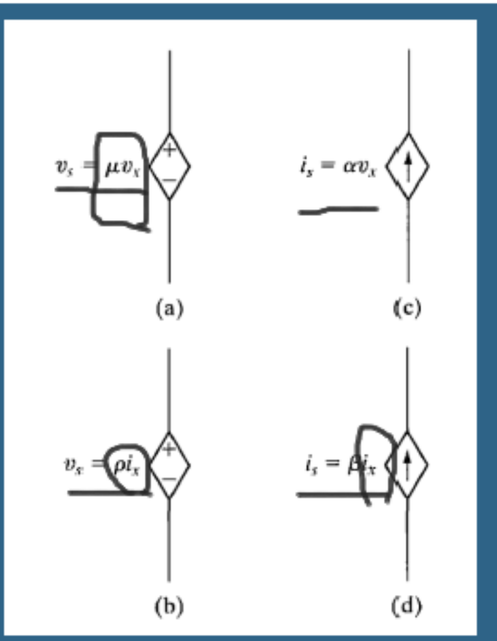
Current is a flow of electrical charge.

- An ideal voltage source is a circuit element that maintains a prescribed voltage(قيمة فرق جهد معروفة) across its terminals regardless of the current flowing in those terminals.

- An ideal current source is a circuit element that maintains a prescribed current through its terminals regardless of the voltage across those terminals.



- A dependent source establishes a voltage or current whose value depends on the value of a voltage or current elsewhere in the circuit.

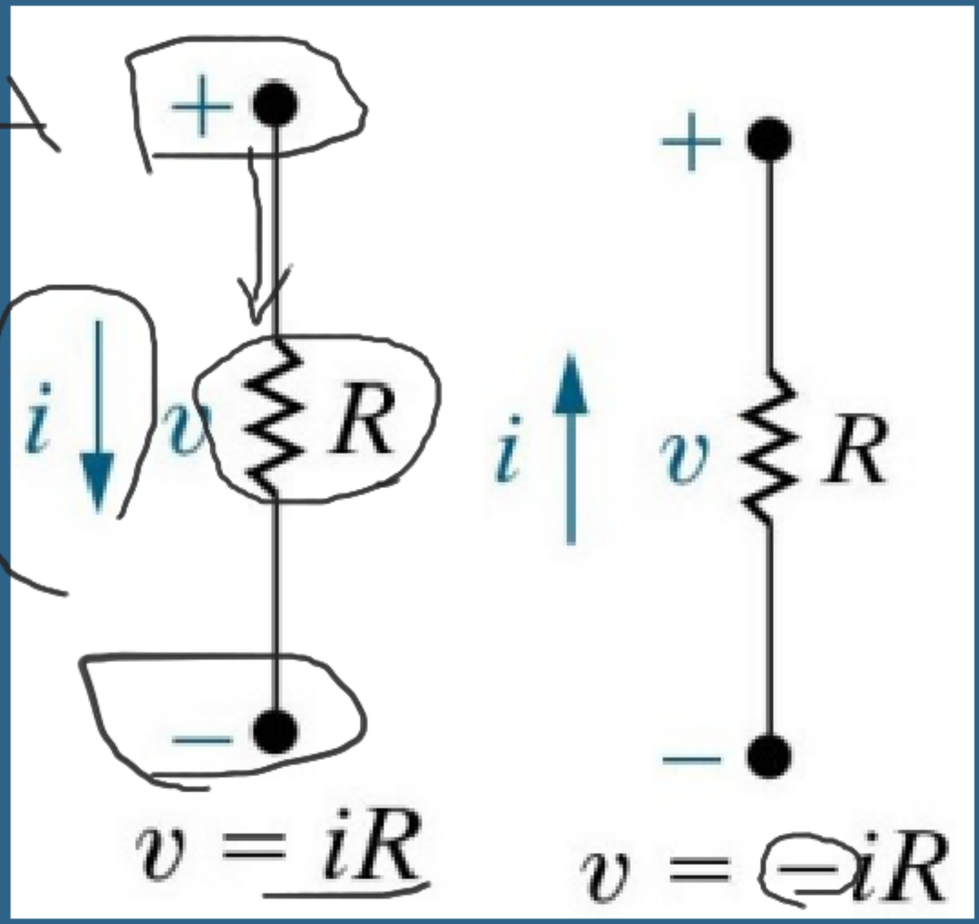


Electrical Resistance (Ohm's Law)

Resistance is the capacity of materials to impede(اعاقة) the flow of the flow of electric charge.

The reciprocal(عكسي) of the resistance is referred to as conductance (G) in Siemens (S)

G = 1/R

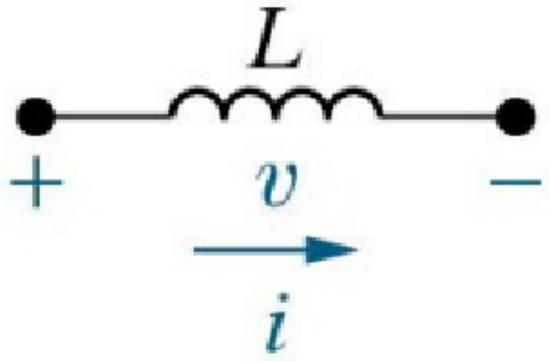


The Inductor

Inductance is the circuit parameter used to describe an inductor.

Inductance (L), is measured in henrys (H), and is represented graphically as a coiled wire.

$$v = L\frac{di}{dt},$$

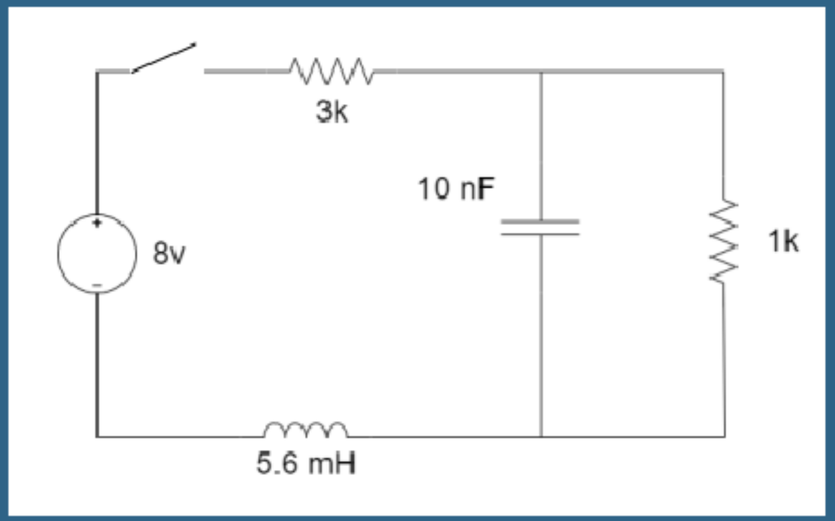


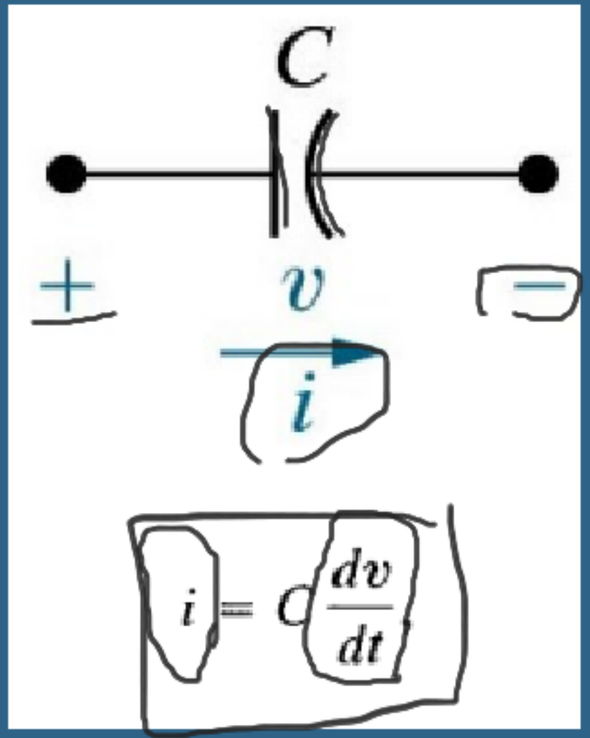
The Capacitor

Although applying a voltage to the terminals of the capacitor cannot move a charge through the dielectric, it can displace a charge within the dielectric.

As the voltage varies with time, the displacement of charge also varies with time, causing what is known as the displacement current.

At the terminals, the displacement current is indistinguishable from a conduction current.
The current is proportional to the rate at which the voltage across the capacitor varies with time.





The Power and Energy

Electrical Energy: is the capacity to do work (J).
Electrical energy is the product of power multiplied by the length of time it was consumed.

Electrical power: rate of change of energy transfer "1Joule/sec = 1Watt".

current flows from +ve to –ve → absorb power

current flows from -ve to +ve → supply power

P_supplied + P_absorbed= 0

$$p = \frac{dw}{dt} = \left(\frac{dw}{dq}\right)\left(\frac{dq}{dt}\right) = vi$$

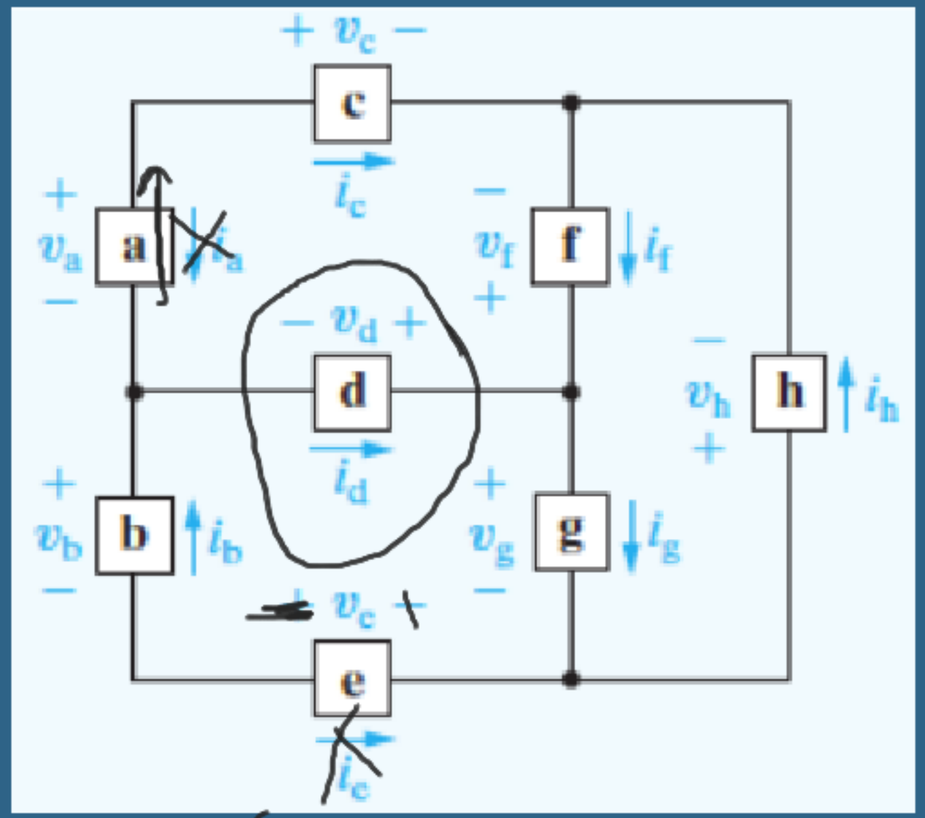


TABLE 1.4 Voltage and current values for the circuit in Fig. 1.7.

Component	v(V)	i(A)
a	120	−10
b	120	9
c	10	10
d	10	1
e	−10	−9
f	−100	5
g	120	4
h	−220	−5

$$p_a = v_a i_a = (120)(-10) = -1200 \text{ W} \qquad p_b = -v_b i_b = -(120)(9) = -1080 \text{ W}$$

$$p_c = v_c i_c = (10)(10) = 100 \text{ W} \qquad p_d = -v_d i_d = -(10)(1) = -10 \text{ W}$$

$$p_e = v_e i_e = (-10)(-9) = 90 \text{ W} \qquad p_f = -v_f i_f = -(-100)(5) = 500 \text{ W}$$

$$p_g = v_g i_g = (120)(4) = 480 \text{ W} \qquad p_h = v_h i_h = (-220)(-5) = 1100 \text{ W}$$

$$p_{\text{supplied}} = p_a + p_b + p_d = -1200 - 1080 - 10 = -2290 \text{ W}$$

$$p_{\text{absorbed}} = p_c + p_e + p_f + p_g + p_h$$

$$= 100 + 90 + 500 + 480 + 1100 = 2270 \text{ W}$$

$$p_{\text{supplied}} + p_{\text{absorbed}} = -2290 + 2270 = -20 \text{ W}$$