Session 7
Analysis of Diode Circuits

Componentes y Circuitos Electrónicos

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Analysis of Diode Circuits

SKILLS

- To review the diode basic work as a circuit component and to review the diode models

- To understand the conduction threshold and its use in diode circuits

- To understand the waveforms in a rectifier circuit and to calculate their fundamental parameters

Analysis of Diode Circuits
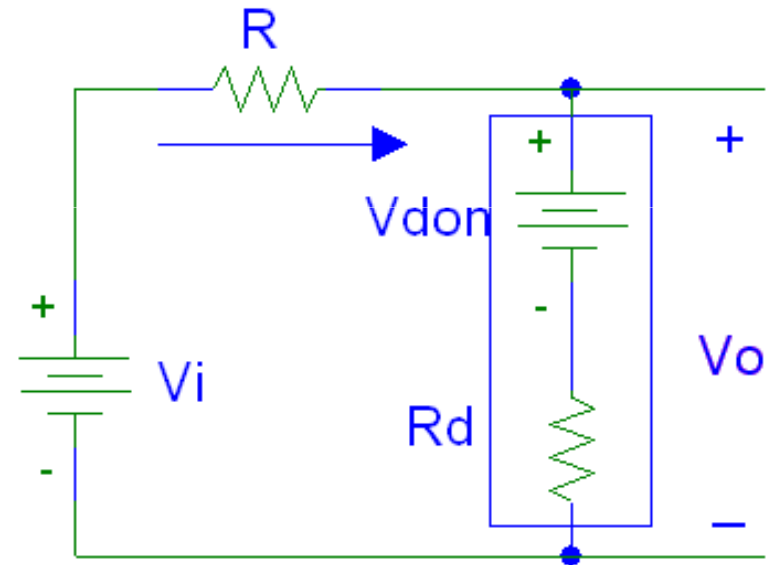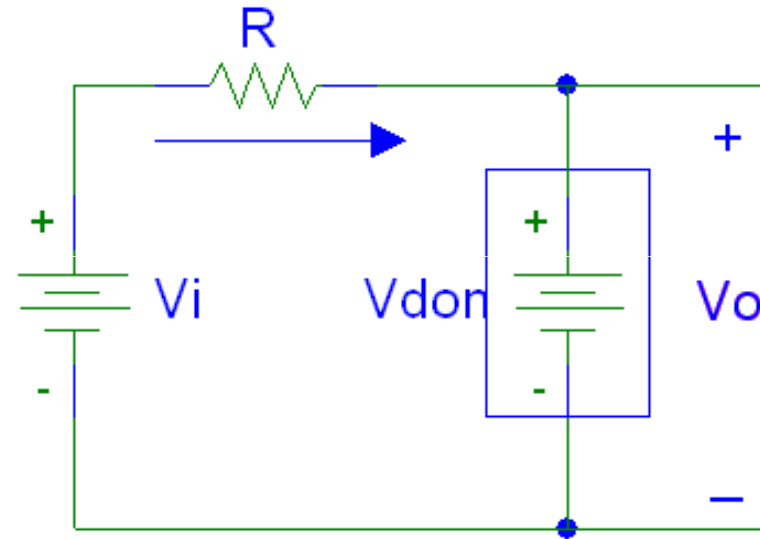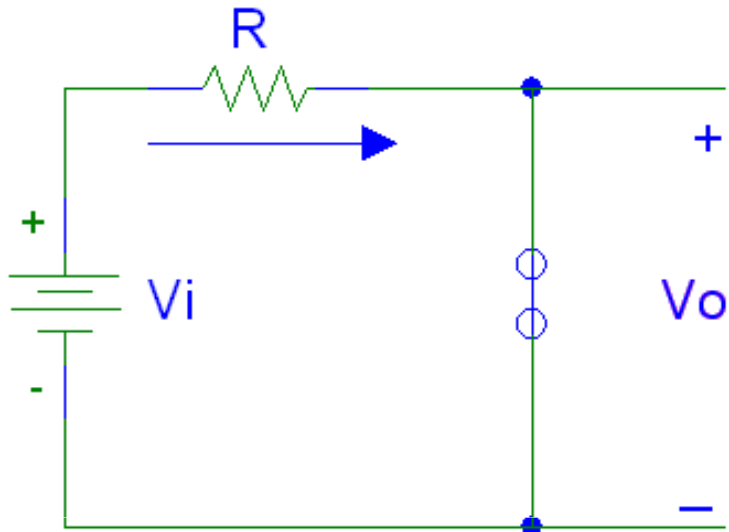# (Analytic solution: equations)
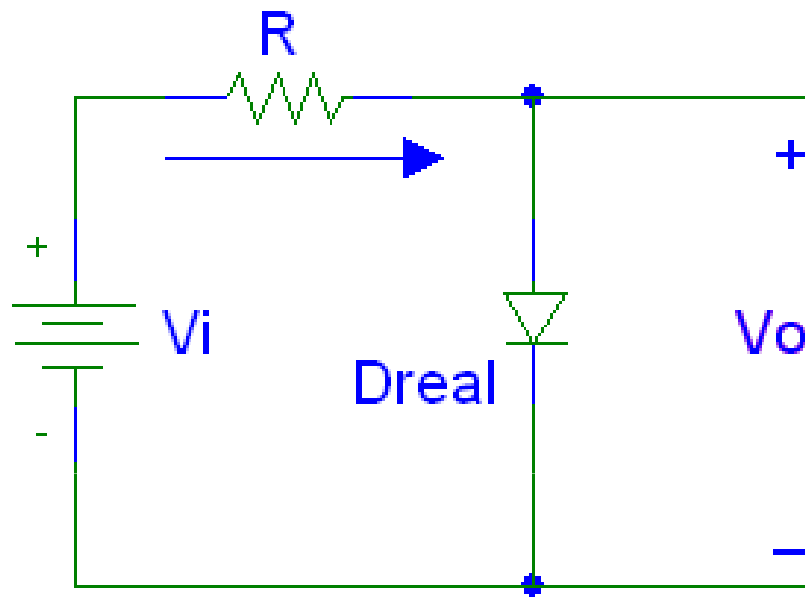
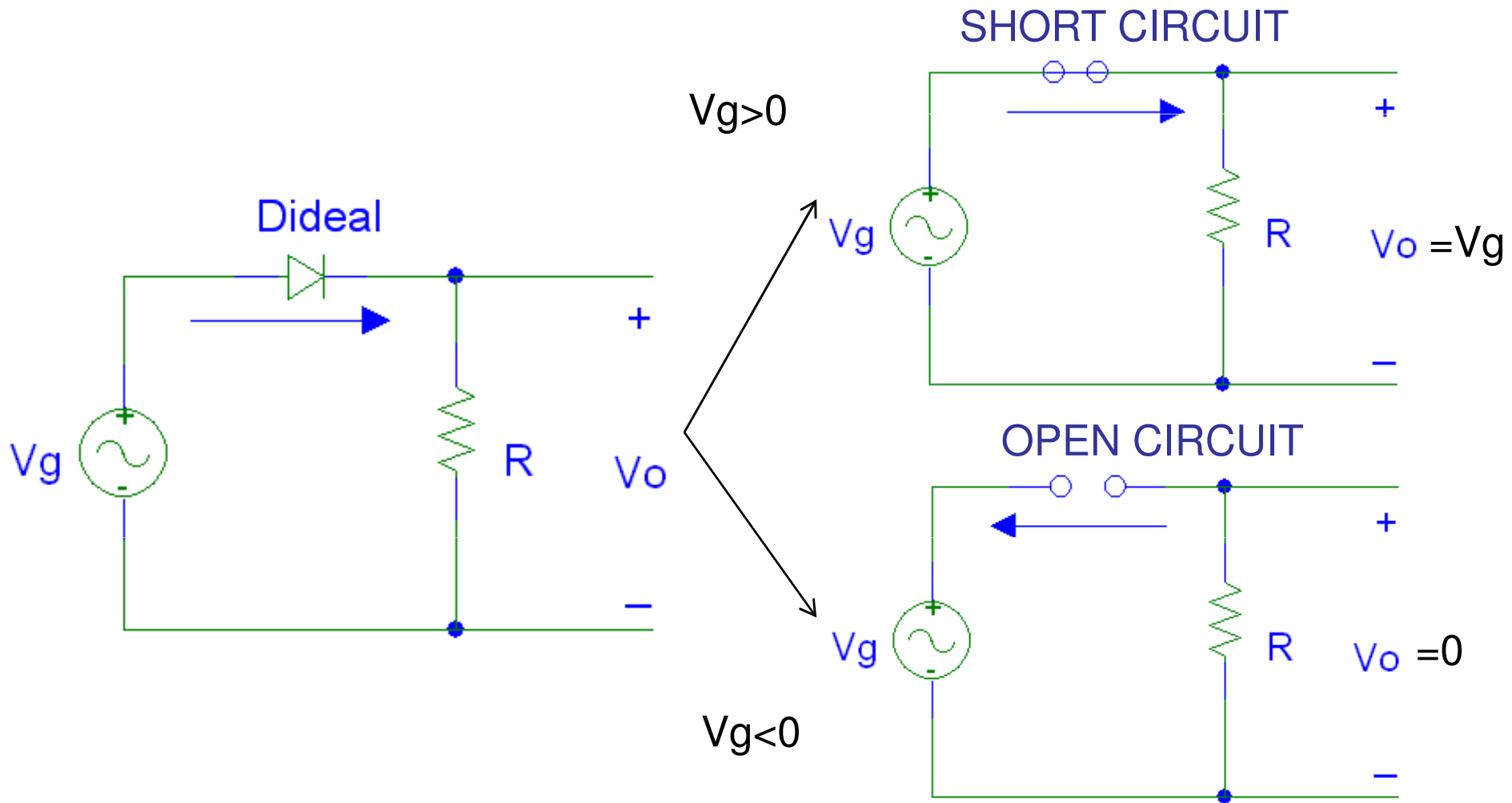$$I_D = I_s \left(e^{\frac{V_D}{nV_T}} - 1 \right)$$

$$V_i = I_D \cdot R + V_D$$

Diode Models

Analysis of Diode Circuits
(Two working regions)

SHORT CIRCUIT

Vg>0

Dideal

Vg

R   Vo

Vo =Vg
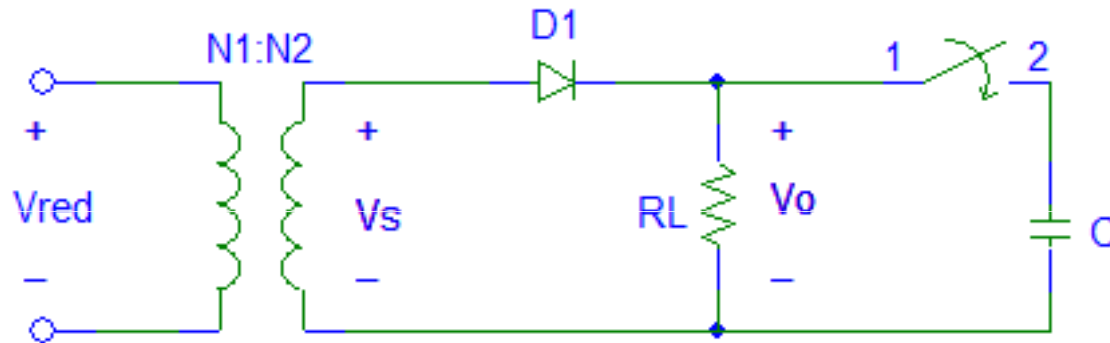
OPEN CIRCUIT

Vg<0

Vg

R   Vo =0

Example: Battery Charger ("Conduction threshold")
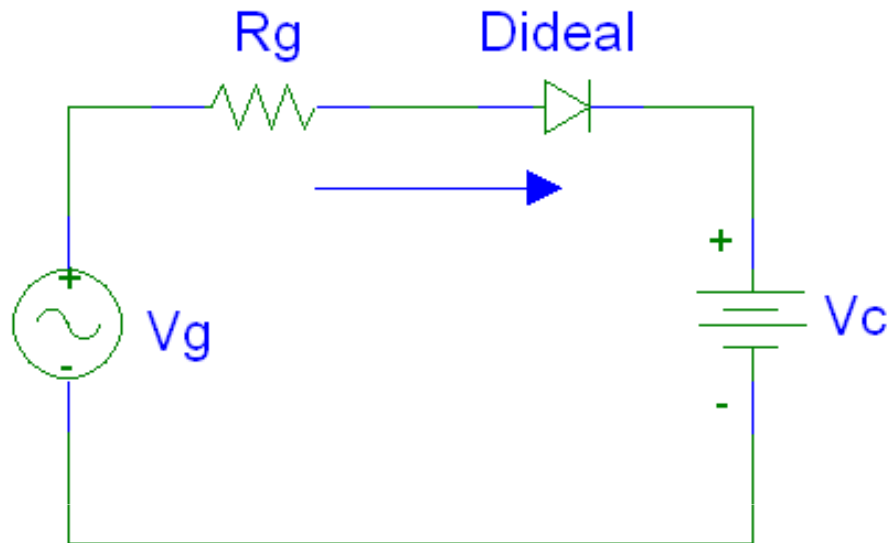
Vg = 15 Vp
- Rg = 100 Ω
- Vc = 9 V

- Draw the diode and resistor voltage waveforms
- Calculate de conduction angle: Vg= Vc.
- Calculate the mean current of battery charge (diode current).

Exercice: Half-Wave Rectifier

DATA: Vred = 220 Vrms; Frequency f = 50 Hz; N1=190; N2=10
    Ideal diodes D1 y D2 V_{Don} = 0 V; RL = 3KΩ; C = 100µF

a) Without the capacitance C:
   - Draw the voltage waveforms Vs and Vo.
   - Calculate the mean value of Vo.
   - Calculate de maximum current in RL.
   - Calculate the peak inverse voltage (PIV) that each diode may support

a) With the capacitance C:
   - Draw the voltage waveforms Vs and Vo.
   - Calculate the peak to peak value of ripple voltage and the mean value of Vo.