Session 9
Diode applications exercices

Electronic Components and Circuits

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Diode Applications Exercices

SKILLS

- To analyze diode circuits
    - Rectifiers
    - Limiters
- To obtain and to interpret the signals and parameters (ripple voltage, PIV, dissipated power) in rectifiers circuits
- To obtain the transfer function in limiters circuits

Rectifier Circuits
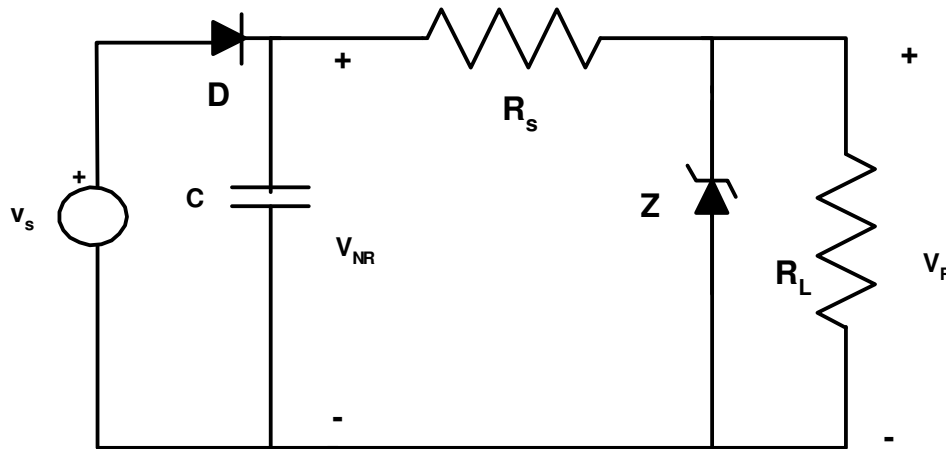
Data:

v_s : Voltage ($24V_{rms}$) in the secondary winding of a transformer connected to the electric network (50Hz)
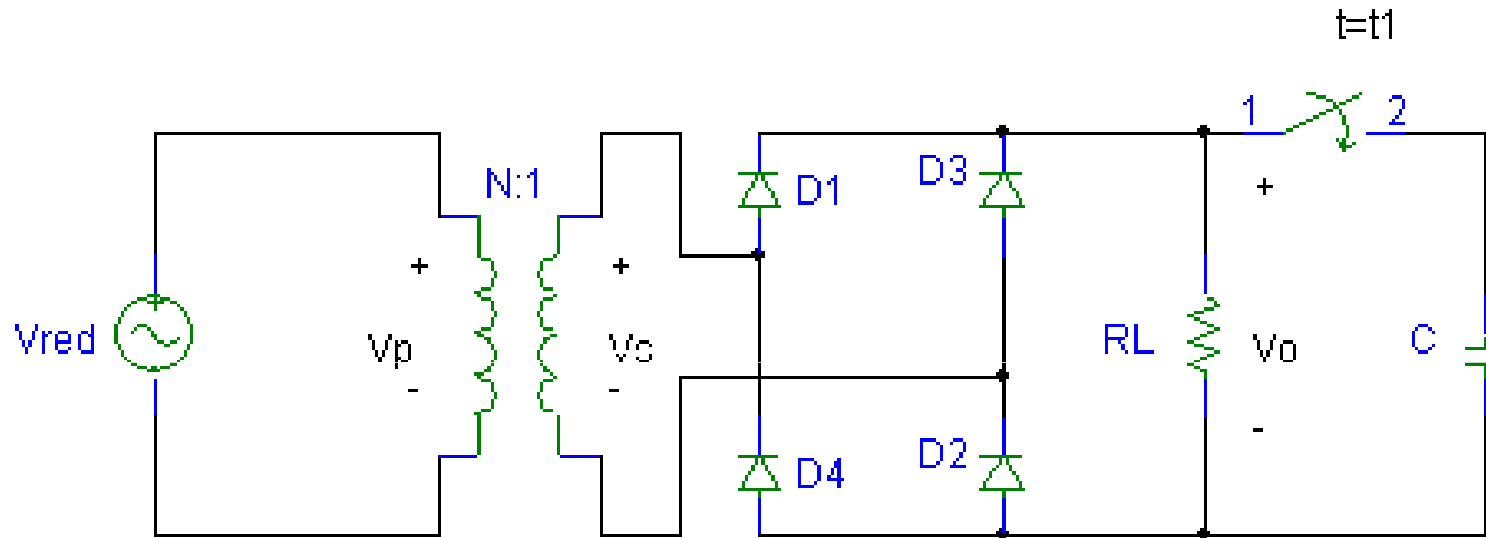
D : Ideal diode

Z : Zener diode with $V_Z = 5V$ and $I_{zmin} = 20mA$

$R_s = 1k\Omega$

$R_L = 1k\Omega$

a) Determine the V_{NR} ripple voltage maximum value
b) Determine the capacitance C to obtain V_{NR} calculated in a)

Rectifier Circuits

DATA: Vred= 120V rms f=60Hz; N=10; R_L=10Ω; Ideal Diodes (V_D=0V)

• Identifie the circuit type and explain a typical application
• Calculate the mean value of the voltage $V_{0(DC)}$ and the current $I_{RL(DC)}$ in the load R_L.
• Calculate the mean value of the current in each ON diode and the peak inverse voltage (PIV) that each diode may support.
• Indicate the ripple signal, $V_{0,}$ frequency and calculate the medium power that the load may dissipate ($P_{0(DC)}$).

At $t=t_1$, the capacitance C is connected to the circuit

• Calculate the capacitance value to have a voltage ripple of 1Vpp.
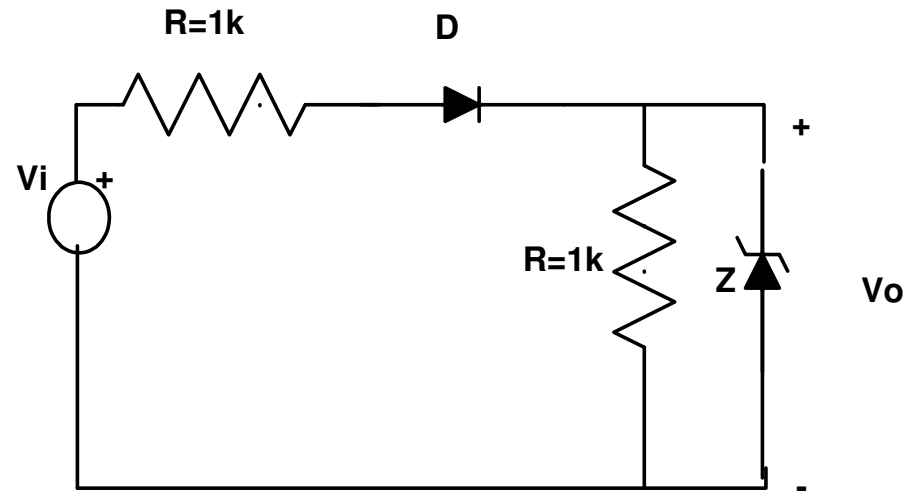• Calculate de peak inverse voltage (PIV) that each diode may support

Limiter Circuits
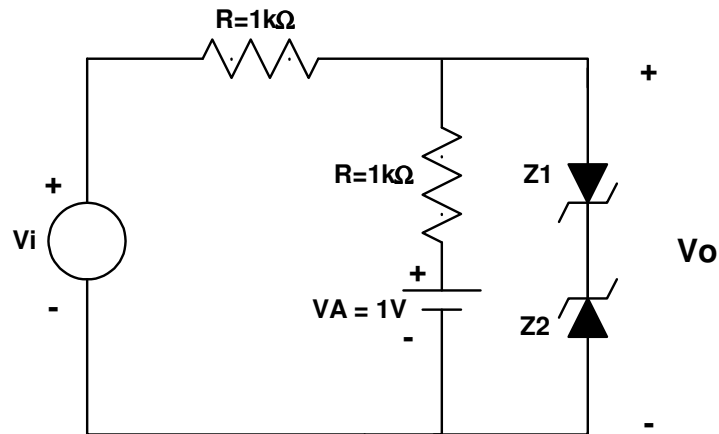
DATA:

Z1, Z2: $V_\gamma = 0.7V$; $V_Z = 5V$

Vi is a voltage source with amplitude **[-20V, +20V]**

• Calculate and draw the circuit transfer function, Vo as a function of Vi

Limiter Circuits

- Calculate and draw the circuit transfer fuction (Vo as a function of Vi)
- Calculate the maximum power that the Zener dissipates in the circuit

Data: D: $V\gamma = 0.7V$
          Z: $V\gamma = 0.7V$ y $Vz = 5V$