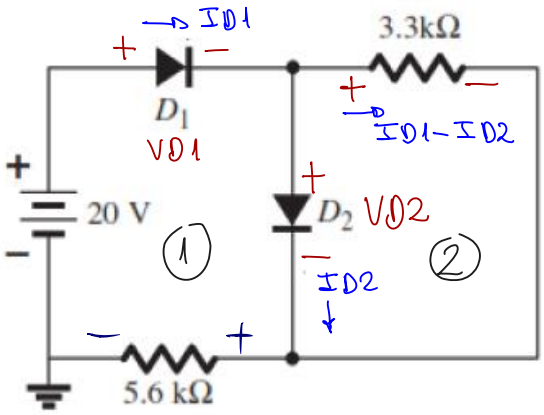
Determinar el punto de operación (V_D, I_D) de los diodos, D1: 0.7V @ 0.5A y D2: 0.8V@1A



SOLUCIÓN

Points of operation:

VD ; ID:

by Kirchhoff: #(1)

$$20 - VD1 - VD2 = 5,6 \times ID1$$

$$\frac{20 - VD1 - VD2}{5,6} = ID1 \quad \ldots (1)$$

$$VD1 = 0,7 + 2,3 \times 0,025 \times \log_{10}\left(\frac{ID1}{500mA}\right)$$

by kirchhoff : #(2)

$$VD2 = 3.3(ID1 - ID2)$$

$$\frac{VD2}{3,3} = ID1 - ID2$$

$$ID2 = ID1 - \frac{VD2}{3,3} \quad \ldots (2)$$

$$VD2 = 0,8 + 2,3 \times 0,025 \times \log_{10}\left(\frac{ID2}{1000mA}\right)$$

Experience #01

ID1 = 3,304 mA
ID2 = 3,062 mA
VD1 = 0,575 V
VD2 = 0,655 V

Experience # 02

ID1 = 3,352 mA
ID2 = 3,154 mA
VD1 = 0,575 V
VD2 = 0,656 V

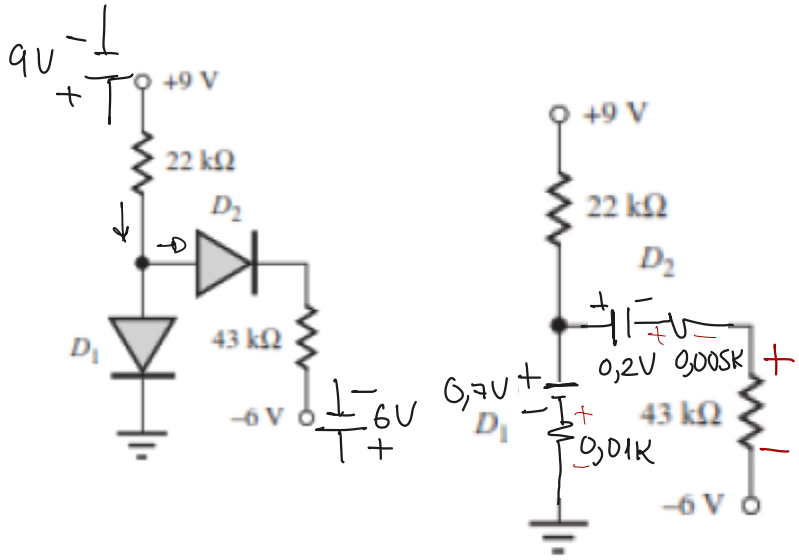
Experiencia # 03

ID1 = 3,352 mA
ID2 = 3,153 mA
VD1 = 0,575 V
VD2 = 0,656 V

For: D1 :: ID1 = 3,352 mA
VD1 = 0,575 V

D2 :: ID2 = 3,153 mA
VD2 = 0,656 V

Hallar las corrientes en los diodos del siguiente circuito D1 Si y rD1=10Ω, D2 Ge y rD2=5Ω



SOLUCIÓN

by Kirchhoff:

#01: $9 - 0,7 = 22(I_{D1} + I_{D2}) + 0,01 \times I_{D1}$

$8,3 = 22,01 I_{D1} + 22 . I_{D2} \ldots (1)$

#02: $6 + 0,7 - 0,2 = -0,01 \times I_{D1} + (0,005 + 43) I_{D2}$

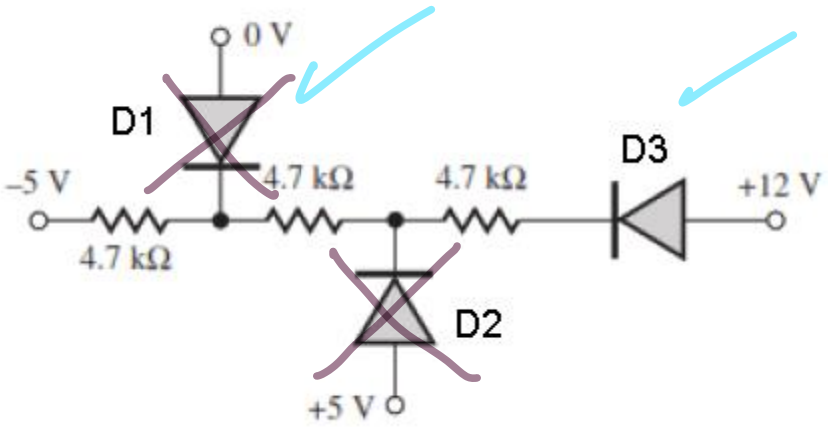
$6,5 = -0,01 \times I_{D1} + (43,005) I_{D2} \ldots (2)$

The currents:

$I_{D1} = 0,226 \text{ mA}$

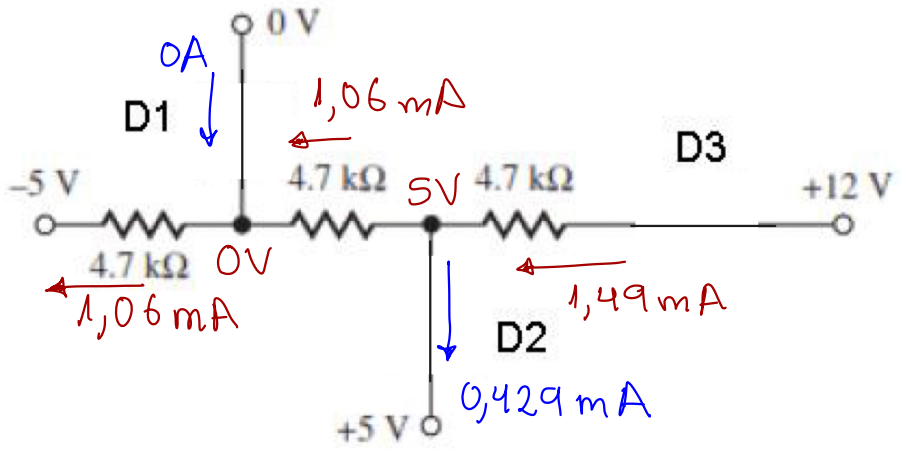
$I_{D2} = 0,151 \text{ mA}$

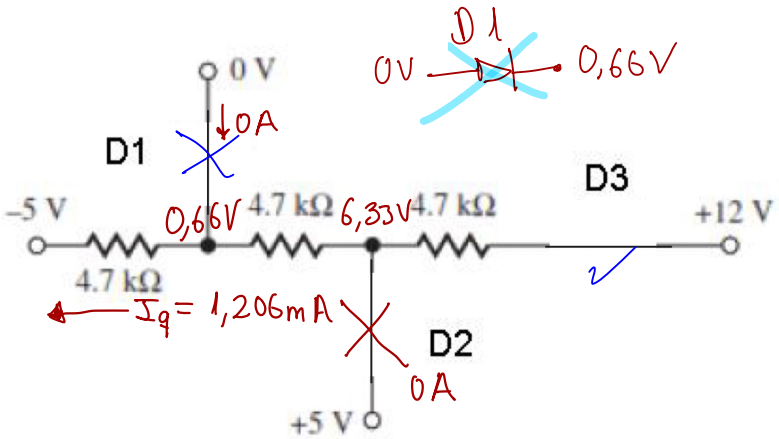
Hallar las corrientes en los diodos del siguiente circuito



SOLUCIÓN

Taking into acount that they are ideal diodes





For diode:

D1: $V_{D1} = -0,66\,V$

$I_{D1} = 0\,A$

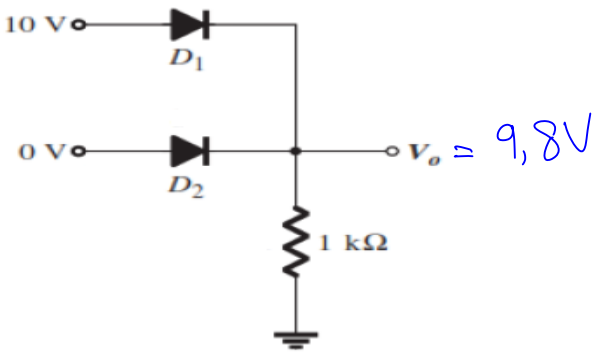
D2: $V_{D2} = -1,33\,V$

$I_{D2} = 0\,A$

D3: $V_{D3} = 0\,V$ porque hace un corto.

$I_{D3} = 1,206\,mA$

Hallar el voltaje Vo si D1: Ge, D2: Si

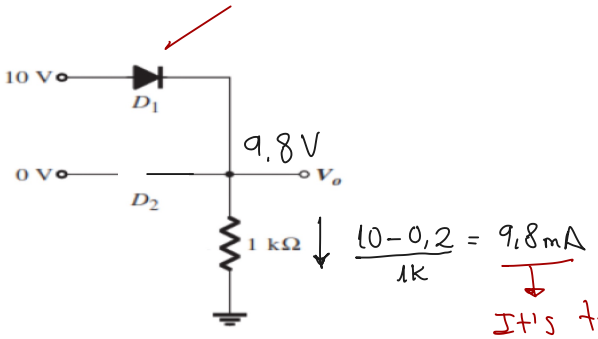


SOLUCIÓN

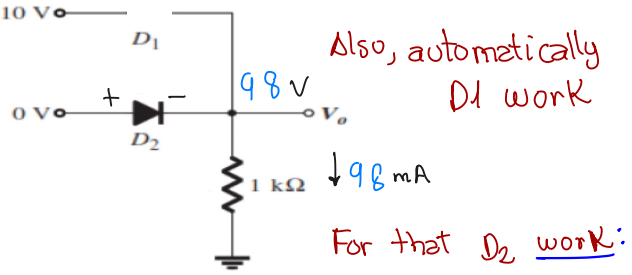
For the diodes: D1: + |– 0,2V

D2: + |– 0,7V

Asu
Assuming it's a gate OR

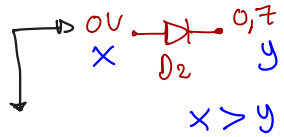


Assuming that D_2 doesn't work.



Also, automatically D1 work

For that D_2 work:



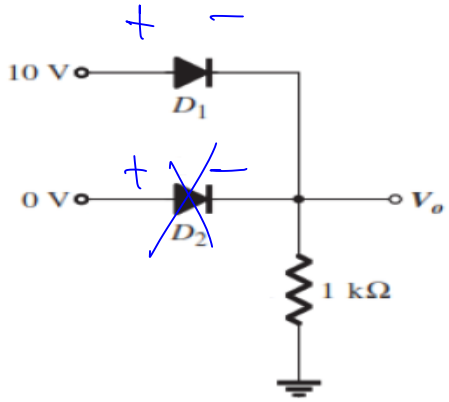
x > y

In this case
0V > 9,8
It's false

Answer:

$V_0 = 10 - 0,2 = 9,8\ V$

Determinar el punto de operación (V_D, I_D) de los diodos, D1: 0.7V @ 0.5A y D2: 0.8V@1A



SOLUCIÓN

D1: 0,7V @ 0,5A

#01

$$10 - V_{D1} = I_{D1} \cdot 1K$$

$$\frac{10 - V_{D1}}{1K} = I_{D1} \quad ...(1)$$

#02

$$V_{D1} = 0,7 + 2,3 \times 0,025 \times \log_{10}\left(\frac{I_{D1}}{500mA}\right)$$

#01 Experience:

$I_{D1} \simeq 9,3mA$

$V_{D1} \simeq 0,6V$

#02. Experience:

$I_{D1} \simeq 9,4mA$

$V_{D1} \simeq 0,6V$

03 Experience

$I_{D1} \simeq 9,4mA$

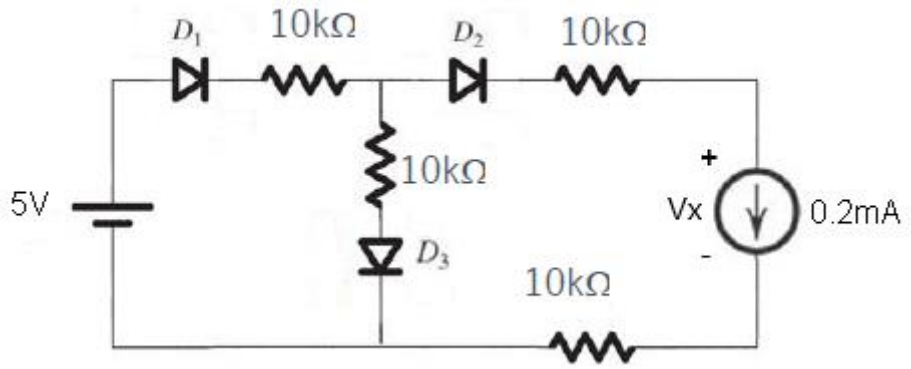
$V_{D1} \simeq 0,6V$

1. En el siguiente circuito determinar, los diodos son:

D_1: Ge, r_D=20Ω

D_2: Si, r_D=10Ω

D_3: Ge, r_D=15Ω



Solución

Por mallas

Malla izquierda:

$$5V = 0.2V + 0.02kxI1 + 10kxI1 + 10k\ (I1 - 0.2mA) + 0.2V + 0.01k(I1 - 0.2mA)$$

$$I1 = 0.33\ mA$$

a. La corriente y voltaje en D_1

$$ID1 = 0.33mA$$
$$VD1 = 0.2V + 0.02kx0.33mA = 0.207V$$

b. La corriente y voltaje en D_2

$$ID2 = 0.2mA$$
$$VD2 = 0.7V + 0.01kx0.2mA = 0.702V$$

c. La corriente y voltaje en D_3

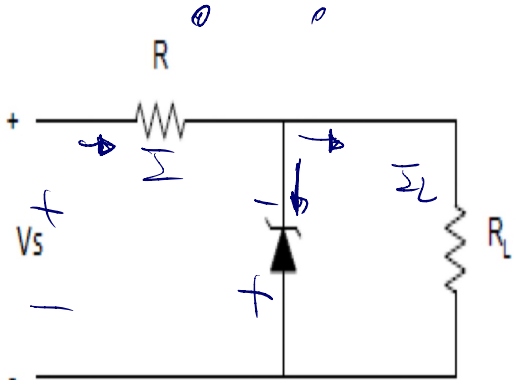
$$ID3 = ID1 - 0.2mA$$
$$ID3 = 0.13mA$$
$$VD3 = 0.2V + 0.015kx0.13mA = 0.202V$$

d. La potencia en la fuente de 5V

$$P5V = -5V\ x\ 0.33mA = -1.65mW$$

e. El voltaje Vx

$$VD3 + ID3x10k = VD2 + 20kx0.2mA + Vx$$
$$Vx = -3.2V$$



2. El diodo zener del circuito tiene las siguientes características:

$$Vz = 6.2V, Izmin = 2\ mA, Pzmax = 0.5W$$

Solución

$$IzM = \frac{0.5W}{6.2V} = 80.65mA$$

a. Para $120\Omega \leq RL \leq 200\Omega$
Calcular el valor de R para: $23.5V \leq Vs \leq 24.8V$.

Caso crítico: menor voltaje de Vs y mayor valor de RL

$$IL = \frac{6.2V}{0.12k} = 51.7mA$$
$$I = Izm + IL = 53.7mA$$
$$R \leq \frac{23.5V - 6.2V}{53.7mA} = 322\Omega$$

Caso crítico: mayor voltaje de Vs y menor valor de RL

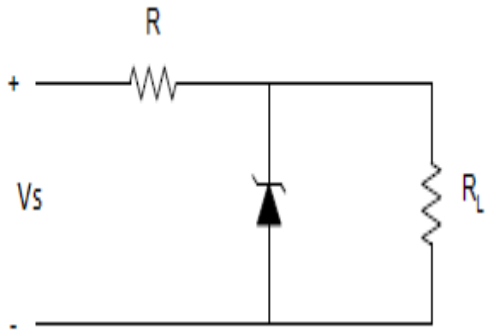
$$IL = \frac{6.2V}{0.2k} = 31mA$$
$$I = IzM + IL = 111.65$$
$$R \geq \frac{24.8V - 6.2V}{111.65mA} = 166.6\Omega$$

$$166.6\Omega \leq R \leq 322\Omega$$

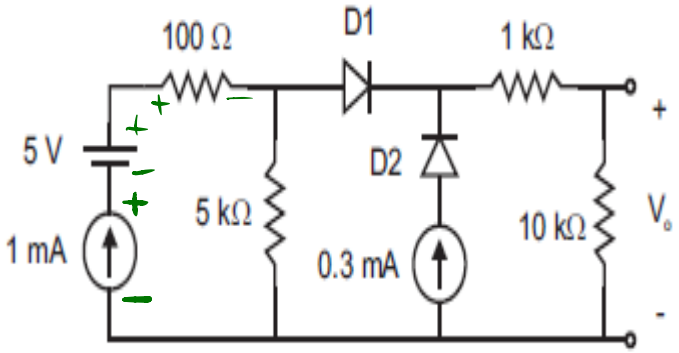
b. Determinar la mínima y la máxima potencia que debe disipar el diodo zener.

$$Pzm = 6.2V\ x\ 2.03mA = 12.6mW$$

$$PzM = 6.2V\ x\ 80.64 = 500mW$$

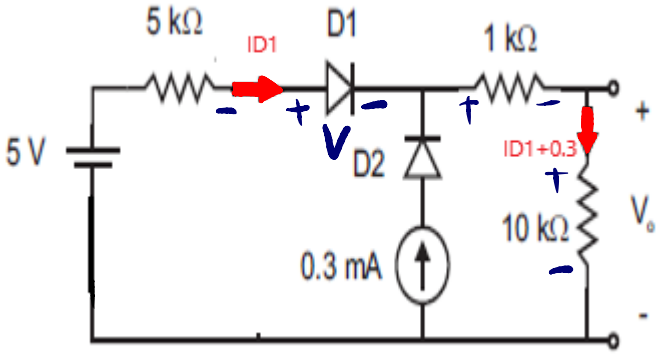


3. En el siguiente circuito:



D_1: 0.9V@800mA
D_2: 0.3V@200mA

Solucionario
Hallando del circuito Thévenin, ramal izquierdo



a. Los voltajes y corrientes en D_1 y D_2

$$ID2 = 0.3mA$$

$$VD2 = 0.3V + 2.3x25mVxlog\frac{0.3mA}{200mA} = 0.138V$$

Ecuaciones para interactuar en D1

$$ID1 = \frac{5V - VD1 - 3.3V}{16k}$$

$$VD1 = 0.9V + 2.3x25mVx\ log\frac{ID1}{800mA}$$

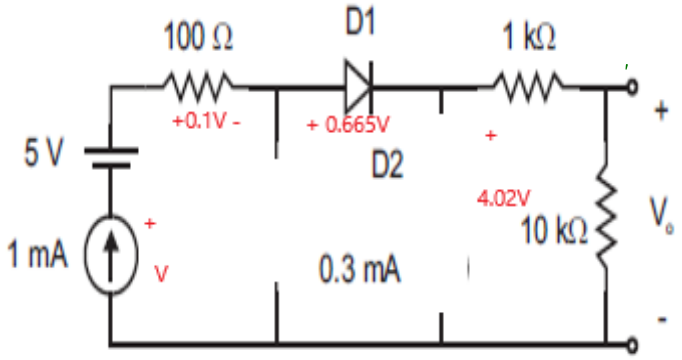
Valores finales

$$ID1 = 0.065mA$$
$$VD1 = 0.665V$$

b. Hallar el voltaje Vo

$$Vo = 10k\ (ID1 + 0.3mA)$$
$$Vo = 3.65V$$

c. La potencia en la fuente de 1mA, determinando los voltajes de la malla externa



$$V = -5V + 0.1V + 0.665V + 4.02V$$
$$V = -0.215V$$

$$P1mA = +0.215Vx1mA = +0.215mW$$