Recitation 2 : Zener diode

Exercise 1

A Zener diode with voltage VZ=45V is used to regulate a rectified and filtered sinusoidal voltage, capable of varying between the limits 40V<e<60V.

We consider the dynamic resistance of the diode to be zero RZ=0.

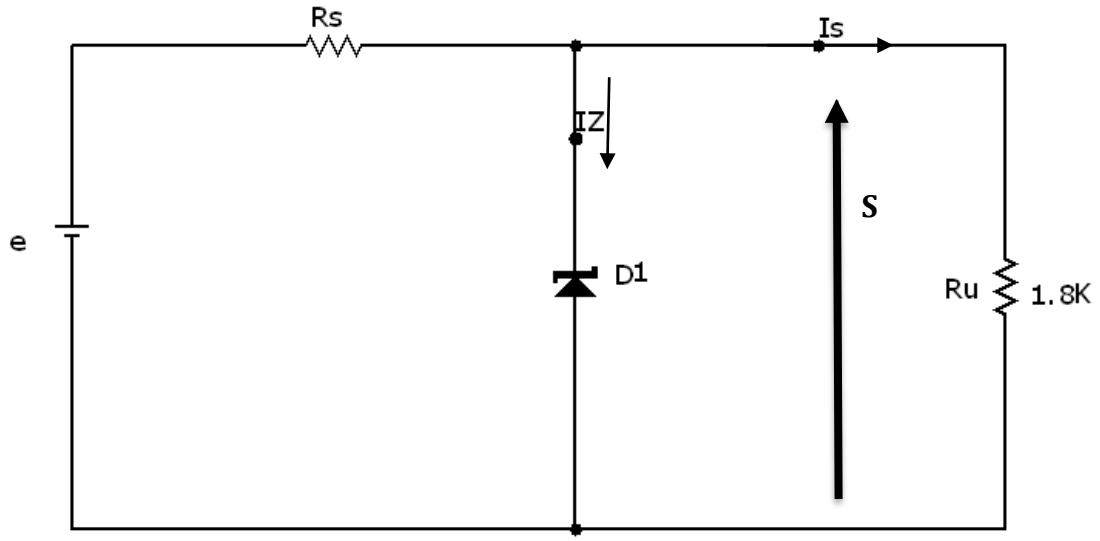

Figure 1

1. When e=40V, we measure Is=20mA. Deduce the value of Rs.
2. From what value of e is the output voltage regulated?
3. Draw the transfer graph s=f(e).
4. Calculate the current Iz in the diode when e=60V.

Exercise 2

We consider the circuit depicted in figure 2 :

1) Determine the resistance values R1 and R2 so that the value of the intensity in the Zener diode $|Iz|$ has a value of 10mA. If we apply to the dipole AB a voltage $V_{AB}=\mp 5V$?

We assume that the threshold voltages are equal to 0.6V, we take Vz=3.2V and we neglect the reverse currents.

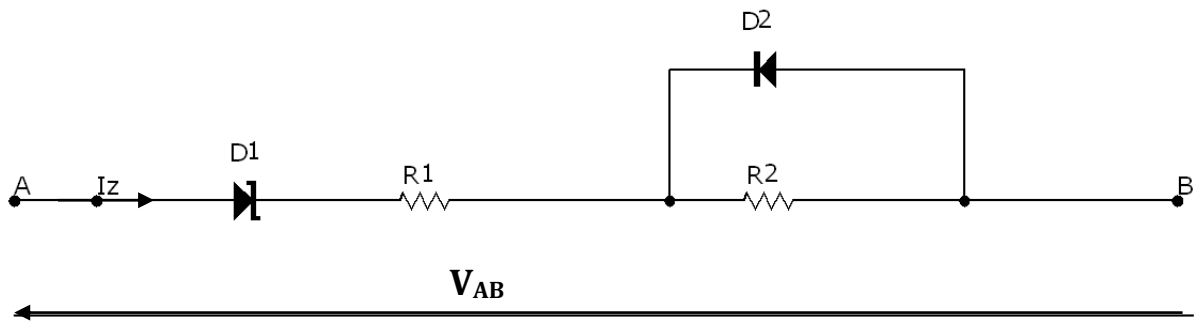

Figure 2

Exercise 3

We consider the circuit below where the two Zener diodes are identical (Vz=5.6V, threshold voltage 0.7V, zero dynamic resistance), we apply $e(t) = VmSin(wt)$.

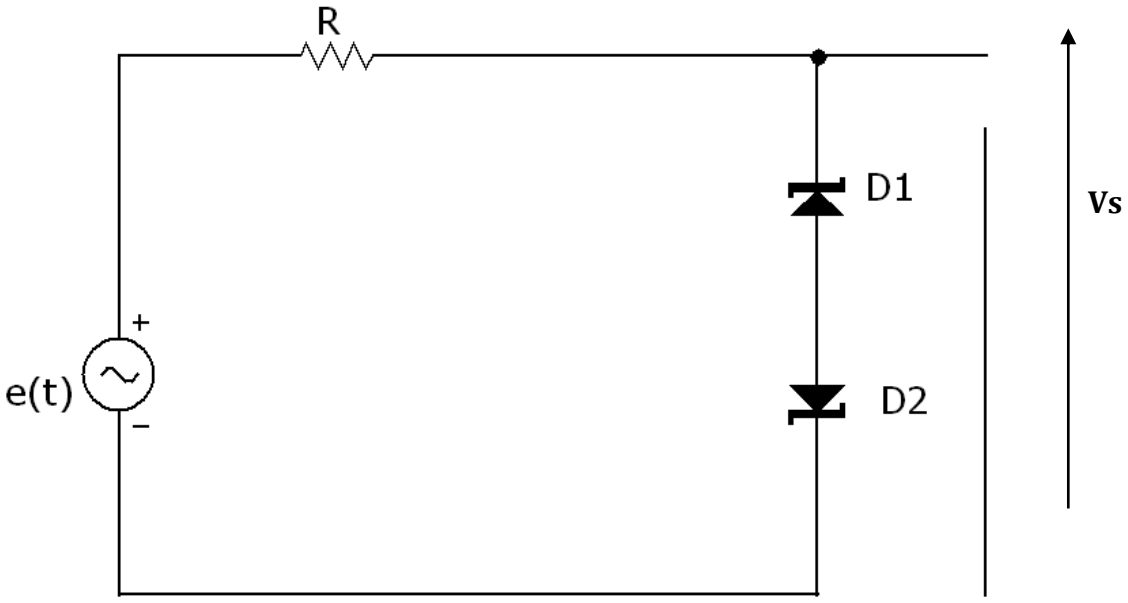

Figure 3

1) Represent e(t) and Vs(t) when Vm=6V then when Vm=8V.

Exercise 4

Analyze the operation of the circuits, and plot the input and the output signal on the same graph.

Knowing that :

- The diode: Vth=0.7V for forward bias.

- The Zener diode: Vz=6V for reverse bias.

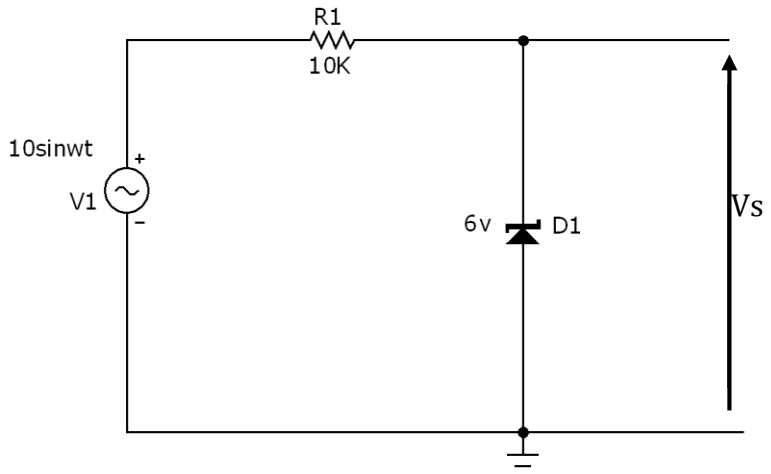

Figure 4

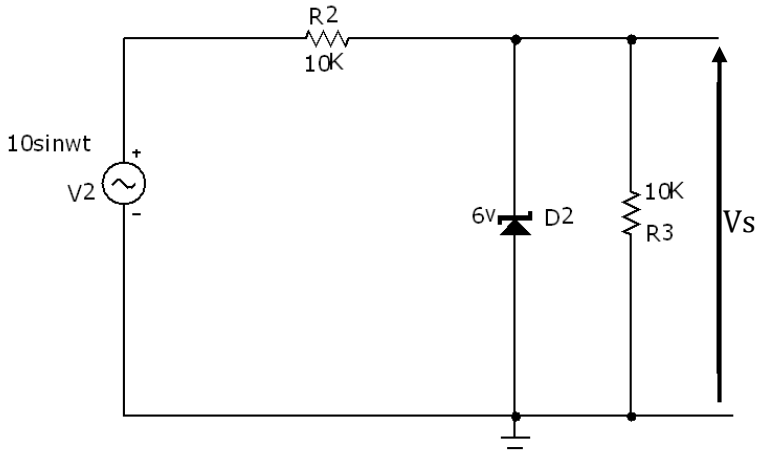

Figure 5

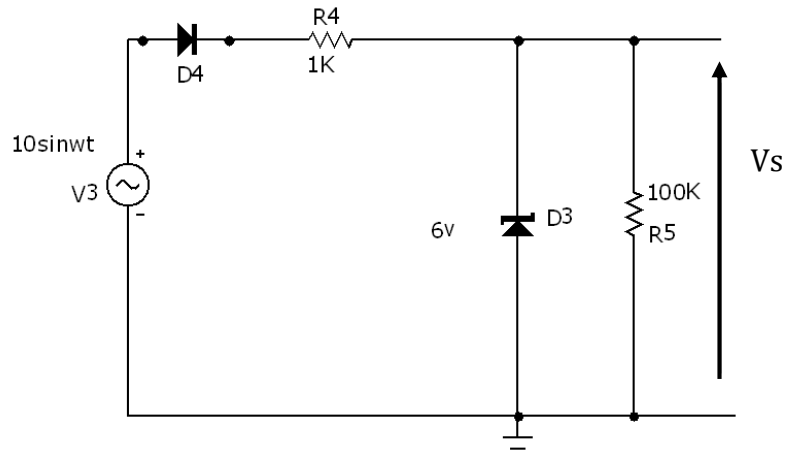

Figure 6

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We consider the circuit bellow, where the Zener diode are characterized by : V_{Z1}=3.3V, V_{Z2}=5.1V, Vth= 0.7V,

$Ve(t) = 10sinwt$.

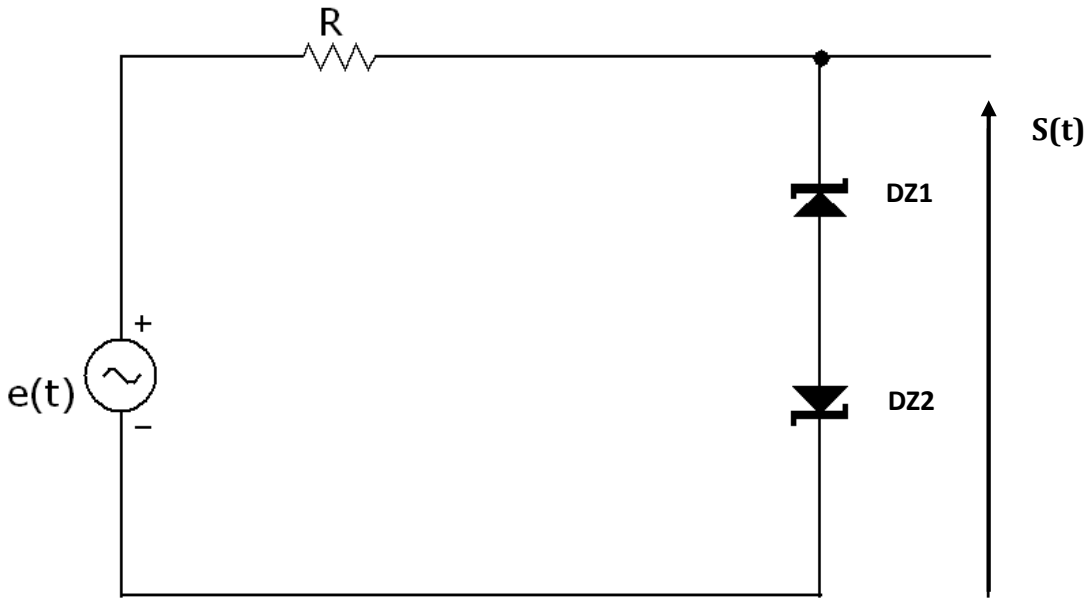

Figure 2

1. Analyze and draw the shape of s(t) and ve(t) in the same graph.