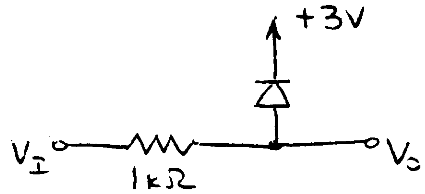
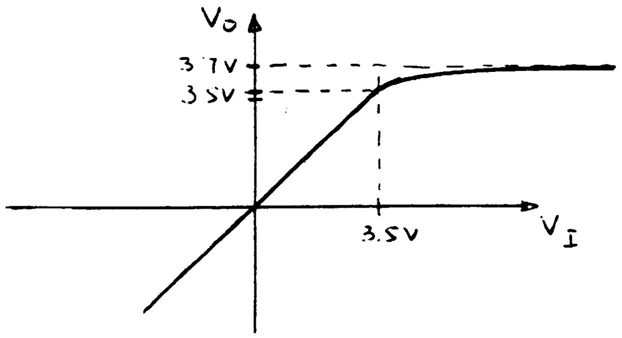
Assignment # 3

EE341

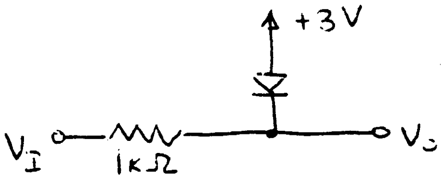
Problem 3.100

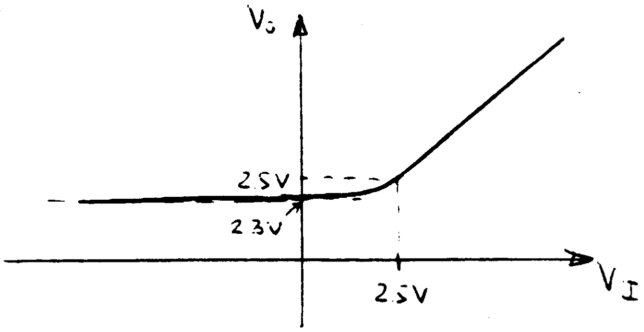
(a)



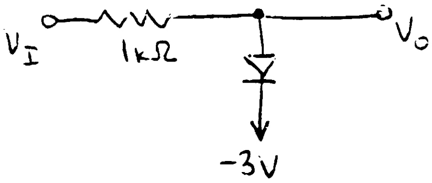


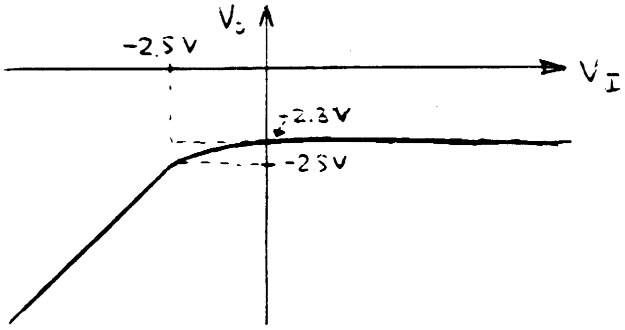
(b)



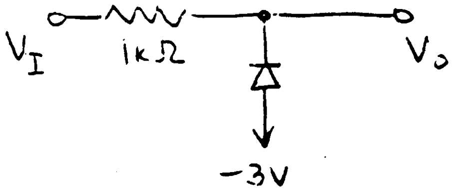


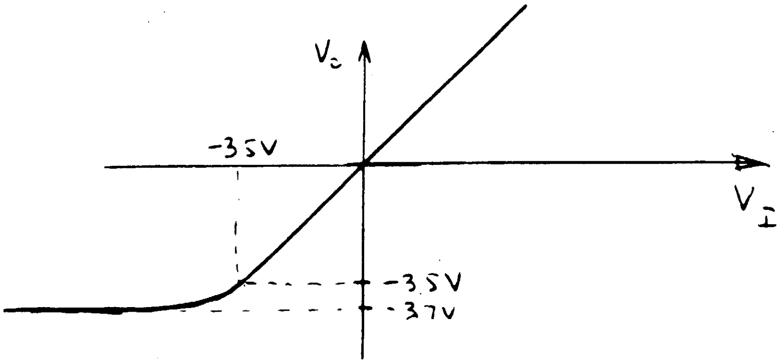
(c)



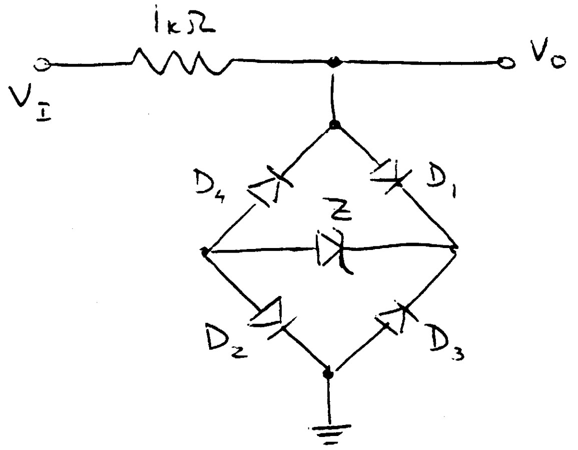


(d)



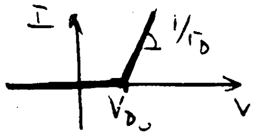


Problem 3.104



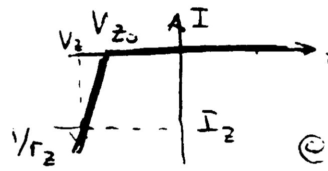
$-20V \le V_I \le 20V$

Diodes $D_1 - D_4$:

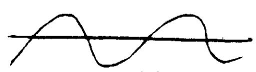


$V_{D_0} = .65V$
$r_D = 20\Omega$

Zener Z:

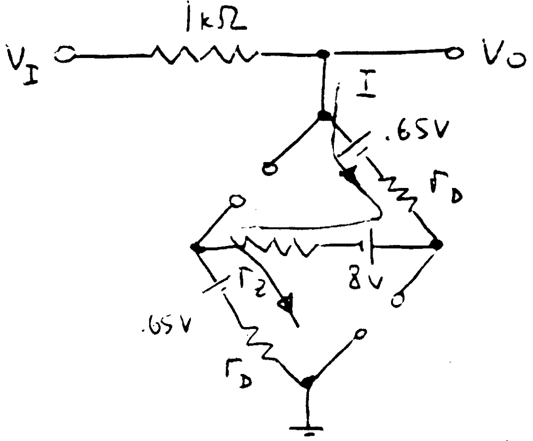


V_{Z_0} - ?
$V_Z = 8.2V$
@ $I_Z = 10mA$
$r_Z = 20\Omega$

First, we have to find out how this circuit operates.
Suppose, V_I is a sinusoidal signal  with average 0.
If voltage is positive and higher than $V_{D_0} = .65V$, but not high enough (let's take 1V), then D_1 is conducting, D_4 is cut off. But D_3 is off and Zener is off, too. The Bridge is not conducting, and $V_o = V_I$. The same is true for negative V_I. So, we need to find a threshold voltage, at which the Bridge starts conducting.

1 step Find $V_{Z_0} = V_Z - I_Z r_Z = 8.2V - 10mA \cdot 20\Omega = \underline{\underline{8V}}$

2 step Draw the equivalence circuit when the Bridge is conducting at positive half-period of V_I.



The bridge starts conducting when $V_I \ge V_{D_0} + V_{Z_0} + V_{D_0} =$

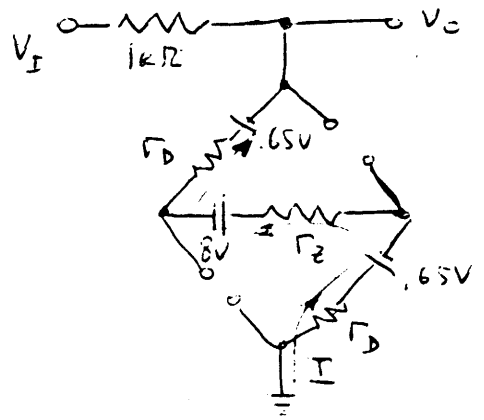
$= .65V + 8V + .65V = 9.3V$

3 step When bridge is conducting, it acts as a voltage divider $V_I = V_o + V_{1k\Omega}$, and

$$m = \frac{V_o}{V_I} = \frac{V_o}{V_o + V_{1k\Omega}} = \frac{2r_D + r_Z}{2r_D + r_Z + 1k\Omega} = \frac{60\Omega}{60\Omega + 1000\Omega} = \underline{0.0566}$$

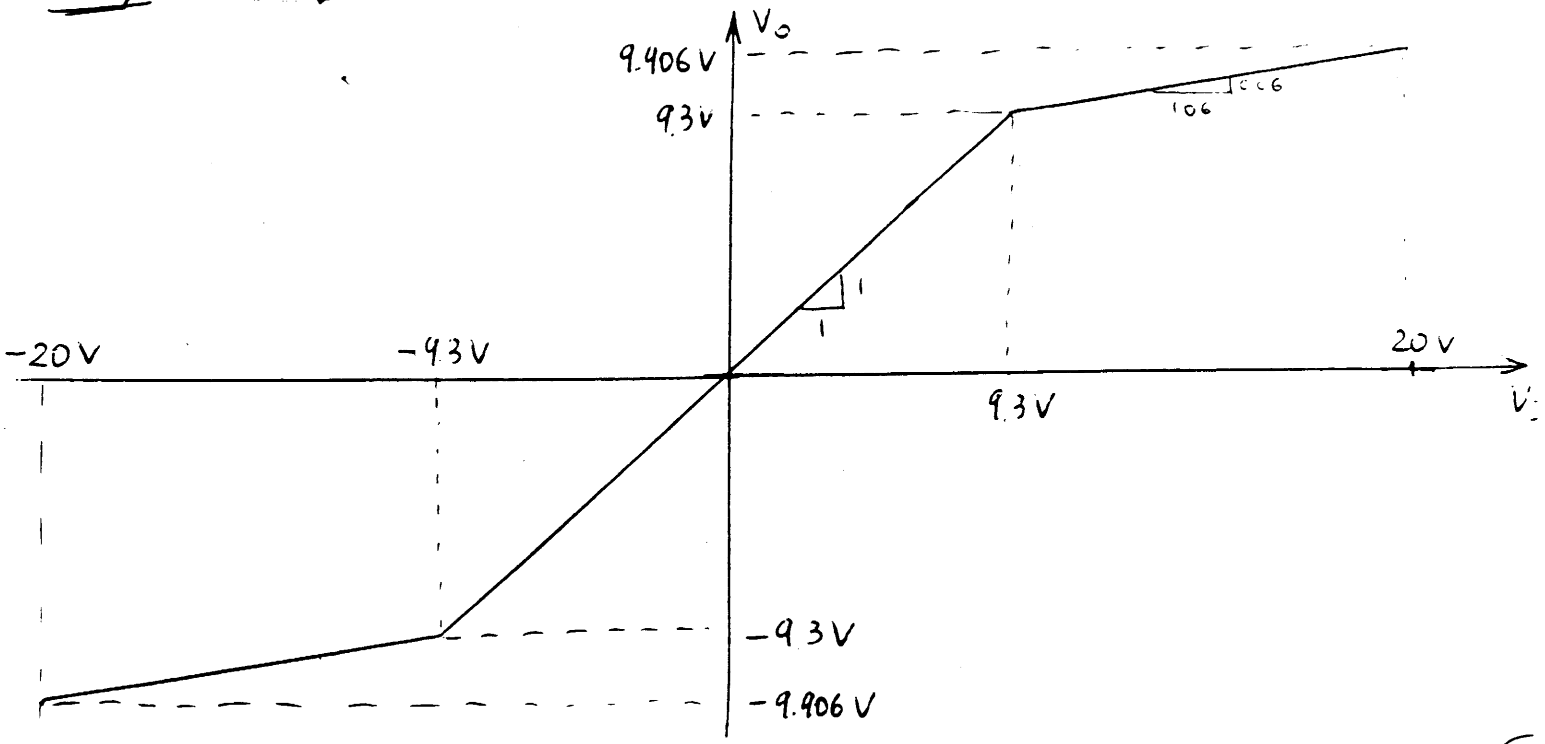
@ $V_I = 20V$ $\quad V_o = 9.3V + (20V - 9.3V)\cdot m = \underline{9.906\,V}$

When the bridge is conducting at negative half-period of V_I, the equivalent circuit is:

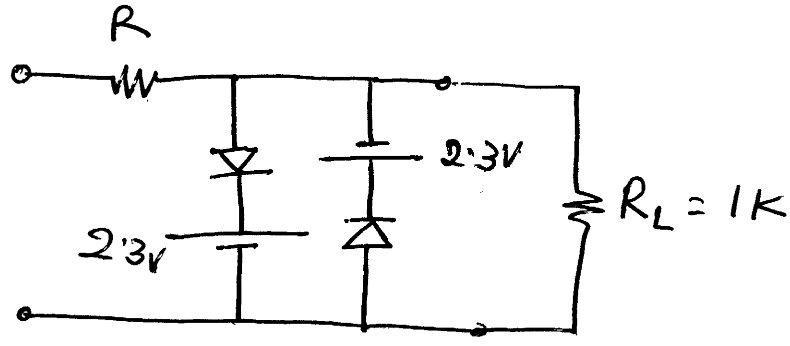


The Bridge starts conducting when
$V_I \leq -9.3V$
m also equal to 0.0566
$V_o(-20V) = -9.906V$

4 step Transfer characteristic



3.67



2·3V power supplies are need to provide ±3V limiting levels

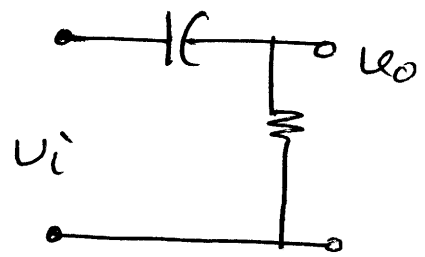
In the nonlimiting region,

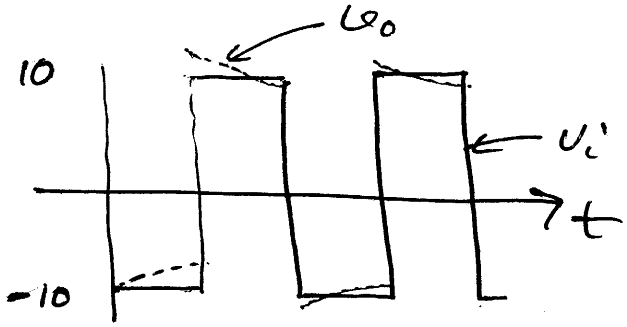
$$\frac{R_L}{R + R_L} = 0.95 = \frac{1}{R + 1K}$$

$$\Rightarrow R = 0.0526\ K = 52.6\ \Omega$$

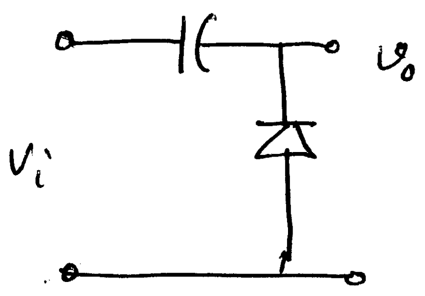
3.111

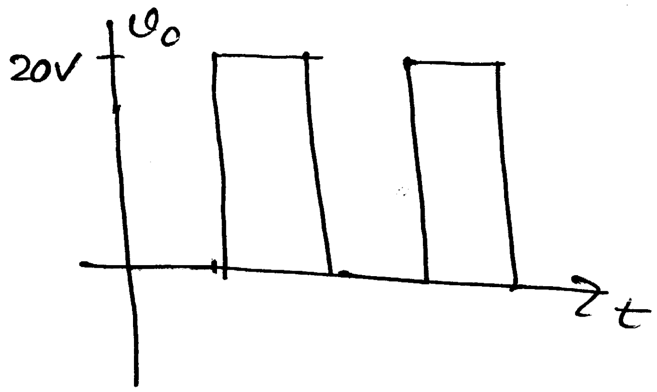
(a)





(b)





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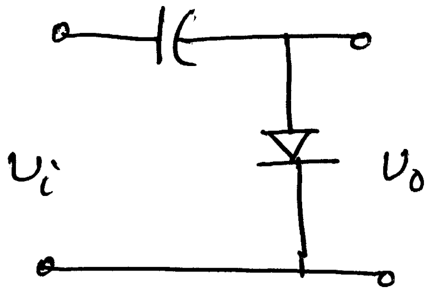

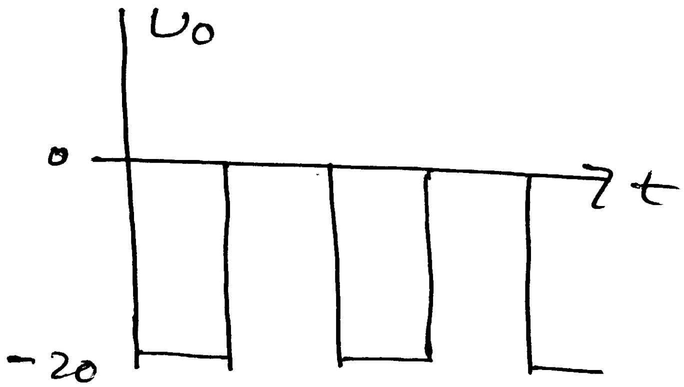

(d)