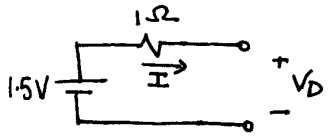
CHAPTER 3 - PROBLEMS

3.1



The diode can be reverse-biased and thus no current would flow, or forward-biased where current would flow.

(a) Reverse biased $I = 0A$ $V_D = 1.5V$

(b) Forward biased $I = 1.5A$ $V_D = 0V$

3.2

(a) Diode is conducting and thus has a 0V drop across it. Consequently

$V = \underline{-3V}$

$$I = \frac{3-(-3)}{10k\Omega} = \underline{0.6mA}$$

(b) Diode is cut off.

$V = \underline{3V}$ $I = \underline{0A}$

(c) Diode is conducting

$V = \underline{3V}$

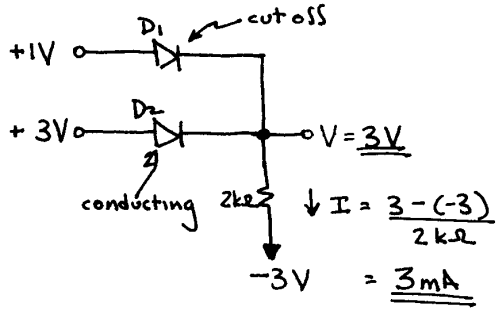
$$I = \frac{3-(-3)}{10k\Omega} = \underline{0.6mA}$$

(d) Diode is cut off.

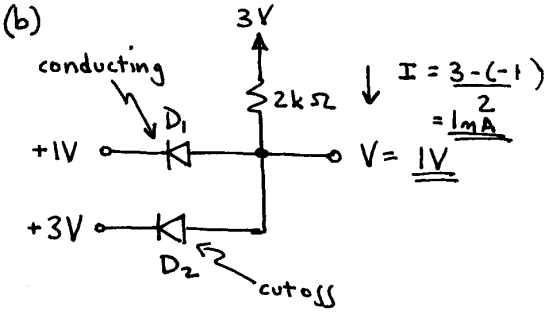
$V = \underline{-3V}$ $I = \underline{0A}$

3.3

(a)

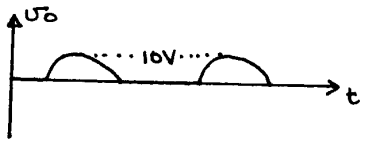


(b)



3.4

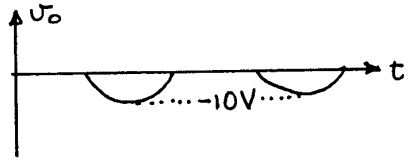
(a)



$V_{p+} = \underline{10V}$ $V_{p-} = \underline{0V}$

$f = 1kHz$.

(b)



$V_{p+} = \underline{0V}$ $V_{p-} = \underline{-10V}$

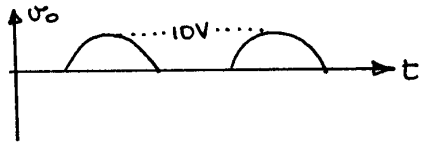
$f = 1kH_3$

(c)

$v_o = \underline{0V}$

Neither D_1 nor D_2 conducts so there is no output.

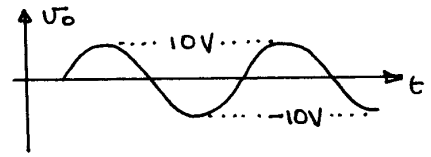
(d)



$V_{p+} = \underline{10V}$ $V_{p-} = \underline{0V}$ $f = 1kH_3$

Both D_1 and D_2 conduct when $v_I > 0$

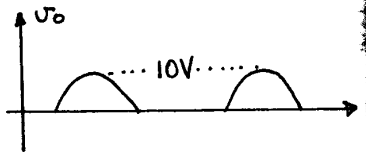
(e)



$V_{p+} = \underline{10V}$ $V_{p-} = \underline{-10V}$ $f = 1kH_3$

D_1 conducts when $v_I > 0$ and D_2 conducts when $v_I < 0$. Thus the output follows the input.

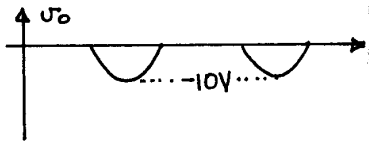
(f)



$V_{p+} = \underline{10V}$ $V_{p-} = \underline{0V}$ $f = 1kH$

$-D_1$ is cutoff when $v_I < 0$

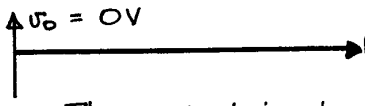
(g)



$V_{p+} = \underline{0V}$ $V_{p-} = \underline{-10V}$ $f = 1kH_3$

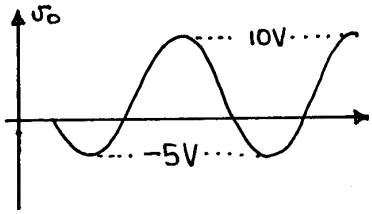
D_1 shorts to ground when $v_I >$ and is cut off when $v_I < 0$ when the output follows v_I.

(h)



$v_o = \underline{0V}$ ~ The output is always shorted to ground as D_1 conducts when $v_I > 0$ and D_2 conduc when $v_I < 0$.

(i)

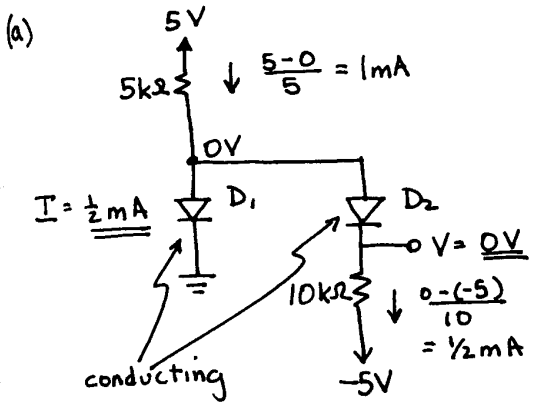


$V_{p+} = \underline{10V}$ $V_{p-} = \underline{-5V}$ $f = 1kH$

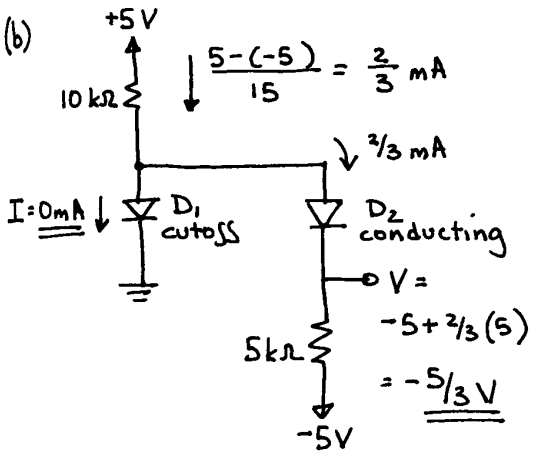
-When $v_I > 0$, D_1 is cutoff and v_o follows v_I.

3.9

(a)

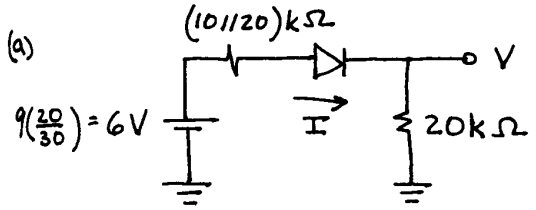


(b)



3.10

(a)

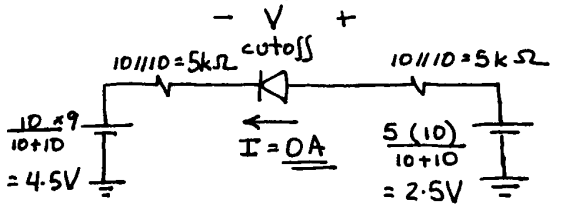


$$I = \frac{6}{(10\|20)+20} = 0.225\,mA$$

$$V = \frac{20}{(10\|20)+20} \times 6 = 4.5\,V$$

(b)

$V = 5/2 - 9/2 = -2V$



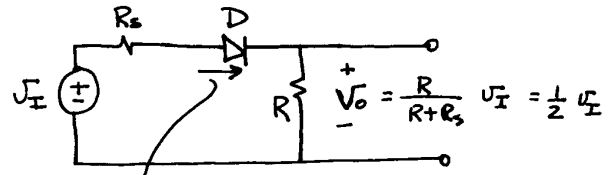
3.11

$$R \gg \frac{120\sqrt{2}}{50} \gg 3.4\,k\Omega$$

The largest reverse voltage appearing across the diode is equal to the peak input voltage

$$120\sqrt{2} = 169.7\,V$$

3.12



$$i_D = \frac{v_I}{R+R_s}$$

D starts to conduct when $v_I > 0$