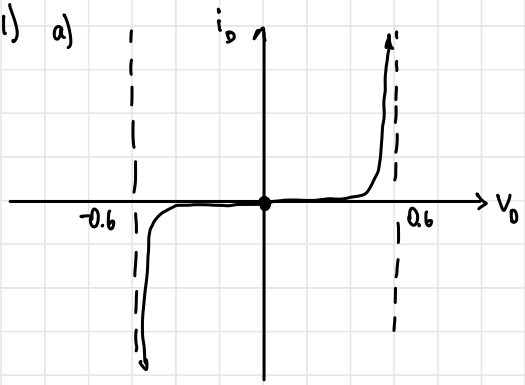
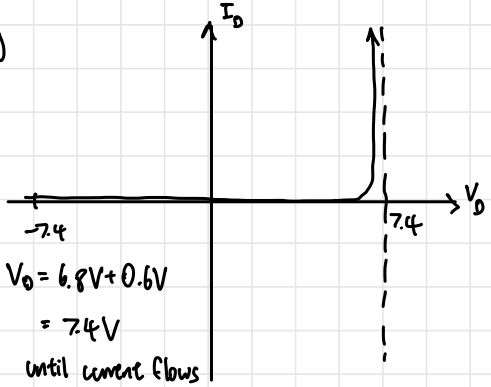
Q1) a)



b)

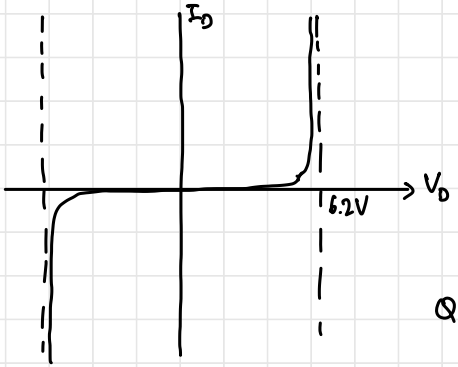


$V_D = 6.8V + 0.6V$

$= 7.4V$

until current flows

c)

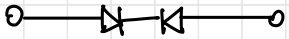


$V_D = 0.6 + 5.6 = 6.2V$

$-V_D = -6.2V$

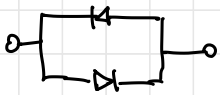
until current flows

Q2)



open circuit aka ⊸ ⊸

b/c both diodes cannot be alive at the same time.



short circuit aka ⊸—⊸

b/c both diodes will have exactly 1 on so it will short while the other opens.

Q3) if the diodes are all on:

a) $I = \frac{10V}{2.7k\Omega} = 3.703\,mA$, $V = 0V$

b) $I = 0A$, $V = 10V$

c) if diode is on, all current branches into the diode, so $I = 0$. $V_D = 0$ b/c the $V_+ = 0$ and $V_- = 0$ since $i = \frac{10}{2.7k\Omega} = 3.7mA$

d) $I_D = 10mA \cdot \frac{1}{1+1} = 5mA$

$I = 10mA - I_D = 5mA \rightarrow V = 5.1 = 5V$

Q4) assume D_1 on D_2 off $\rightarrow V = 15 \cdot \frac{10}{10+5}$

a) $= 10V$. nothing goes through D_2 so

$I = 0A$ $i_{D_1} > 0$ $V_{D_2} < 0$ b/c

$V_{D_2} = 15 \cdot \frac{5}{10+5} - 10 = -5$ ✓

b) assume D_1 on D_2 off: $I = \frac{6}{1k} = 6mA$

$V_{D_2} = 3-6 = -3V < 0$, $I_{D_1} > 0$ ✓

$V = 6V$, $I = 6mA$

c) assume D_1 on D_2 on:

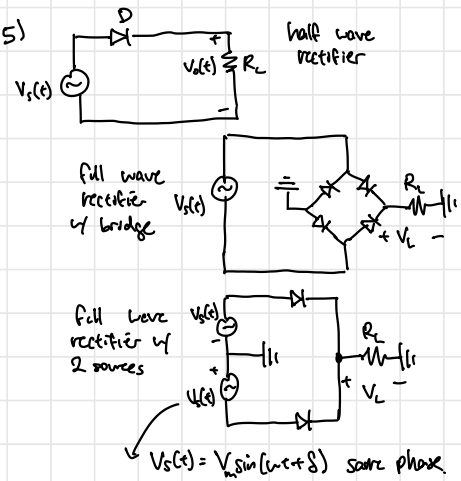
$I_{D_1} = 15V/1k + 30V/2.2k$

$= 15m + 13.636m = 28.636mA > 0$

$I_{D_2} = 13.636m + 30/1.5k = 33.636mA > 0$ ✓

$I = 33.64mA$, $V = 30V$.

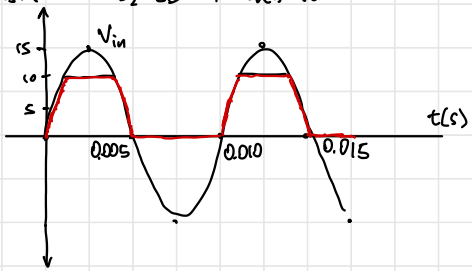
Q5)



$V_s(t) = V_m \sin(\omega t + \delta)$ same phase

Q6) $V_s < 10 \rightarrow D_2$ off & $V_o(t) = V_s$

$V_s > 10 \rightarrow D_2$ BD & $V_o(t) = 10$



Q7) $I_D = I_S \cdot e^{V_D/nV_T} - 1 \rightarrow I_S = \frac{I_D}{e^{V_D/nV_T}-1} = \frac{0.2mA}{e^{0.6/2\cdot 0.026}-1}$

$I_S = 1.95\,nA$

$V_{D_2} = 0.65V \rightarrow i_{D_1} = 1.95nA \cdot e^{0.65/2\cdot 0.026} - 1 = 0.523\,mA$

$V_{D_3} = 0.7V \rightarrow i_{D_2} = 1.95nA \cdot e^{0.7/2\cdot 0.026} - 1 = 1.369\,mA$

Q8) $-V_S + i_x R_S + V_x = 0 \Rightarrow i_x = \frac{V_S - V_x}{R_S} = \frac{3V - V_x}{1} = 3 - V_x$

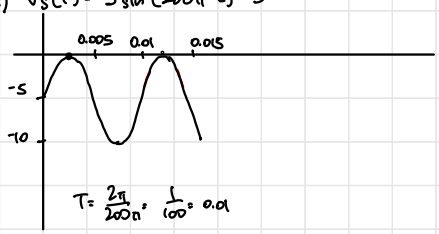
Point 1: $V_x = V_S = 3$ $i_x = 0 \rightarrow (3,0)$

2: $V_x = 0$, $i_x = V_x/R_x = 3 \rightarrow (0,3)$

$-V_x + 3 = (e^{V_x} - 1)/10$

graphing calc $\rightarrow V_x = 2.199$ $i_x = 801\,mA$

Q9) $V_S(t) = 5\sin(200\pi t) - 5$

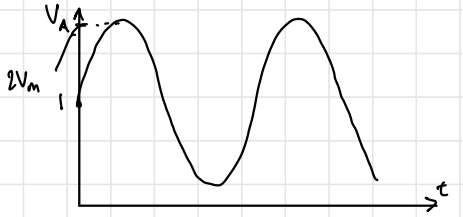


$T = \frac{2\pi}{200\pi} = \frac{1}{100} = 0.01$

Q10) D_1 on D_2 off with $V_{in} < 0 \rightarrow V_{C_1} = -V_m$

D_1 off D_2 on with $V_{in} > 0 \rightarrow V_{C_2} = V_S - V_{C_1}$

$V_L = V_{C_2} = V_S - V_{C_1} = 2V_m \rightarrow$ voltage doubler



$V_{D_1 max} = V_S - V_{C_1} = V_m$ & $V_{D_2 max} = V_S - V_{C_2} = 2V_m$