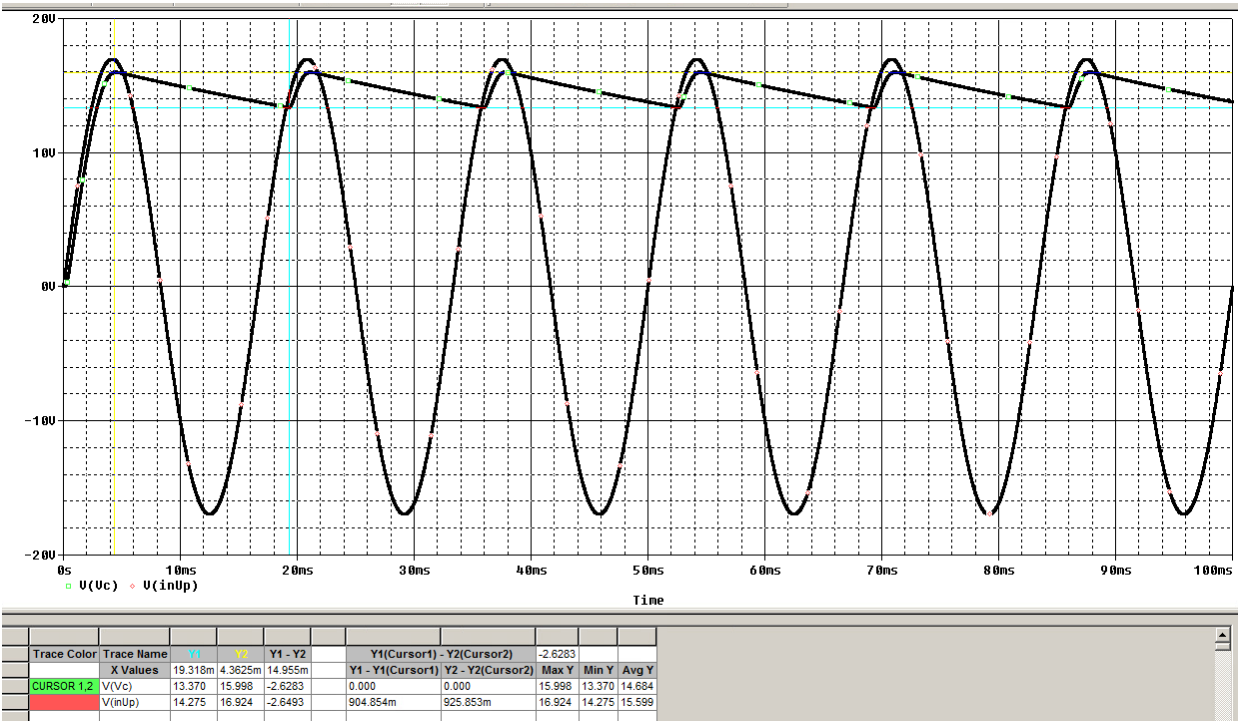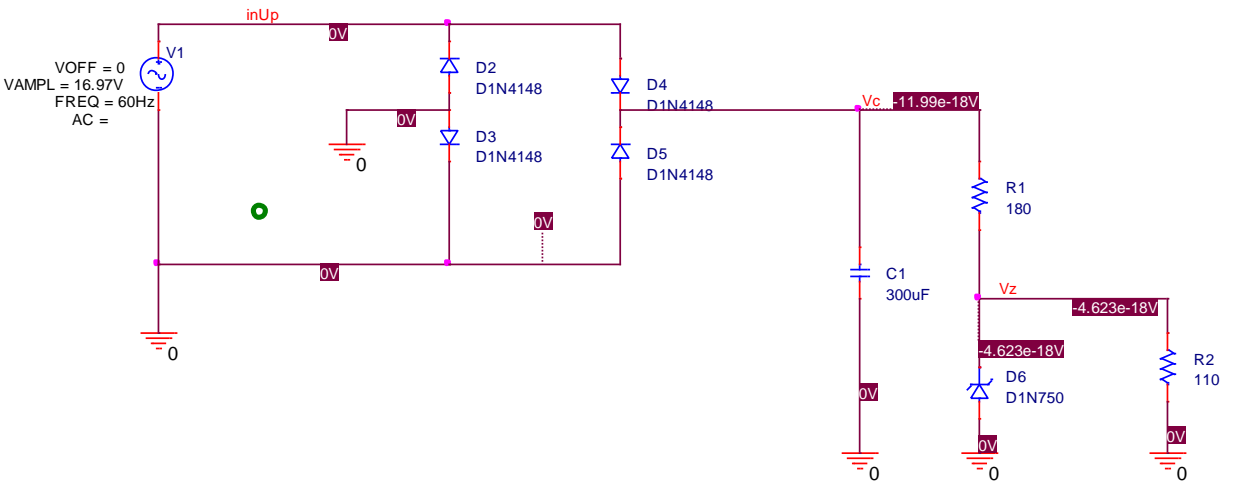Rong Zheng

Z23007381

Homework 2 part B

3.1) Find Vc.
$$V_{speak} = \frac{V_{line}}{N} = \frac{169.7}{10} = 16.97V$$
$$Vc_{peak} = V_{speak} - 2Vd = 16.97 - 2(0.7) = 15.57V$$

Trace Color	Trace Name	Y1	Y2	Y1 - Y2	Y1(Cursor1) - Y2(Cursor2)	-2.6283				
	X Values	19.318m	4.3625m	14.955m	Y1 - Y1(Cursor1)	Y2 - Y2(Cursor2)	Max Y	Min Y	Avg Y	
CURSOR 1,2	V(Vc)	13.370	15.998	-2.6283	0.000	0.000	15.998	13.370	14.684	
	V(inUp)	14.275	16.924	-2.6493	904.854m	925.853m	16.924	14.275	15.599	

3.2) $R = 180 \, \Omega$ $T = \frac{1}{60} = 16.67 \, ms$

$$V_r = \frac{V_{cpeak} \cdot T}{2RC} = \frac{15.57 \cdot 16.67 \cdot 10^{-3}}{2(180)(300 \cdot 10^{-6})} \cong 2.4 \, V$$

$$V_{cmin} = V_{cpeak} - V_r = 15.57 - 2.4 \cong 13.17 \, V$$

Trace Color	Trace Name	Y1	Y2	Y1 - Y2	Y1(Cursor1) - Y2(Cursor2)	-2.5842		
	X Values	19.414m	4.3625m	15.051m	Y1 - Y1(Cursor1)	Y2 - Y2(Cursor2)	Max Y	Min Y	Avg Y
	V(inUp)	14.545	16.924	-2.3790	1.1311	925.853m	16.924	14.545	15.734
CURSOR 1,2	V(Vc)	13.414	15.998	-2.5842	0.000	0.000	15.998	13.414	14.706
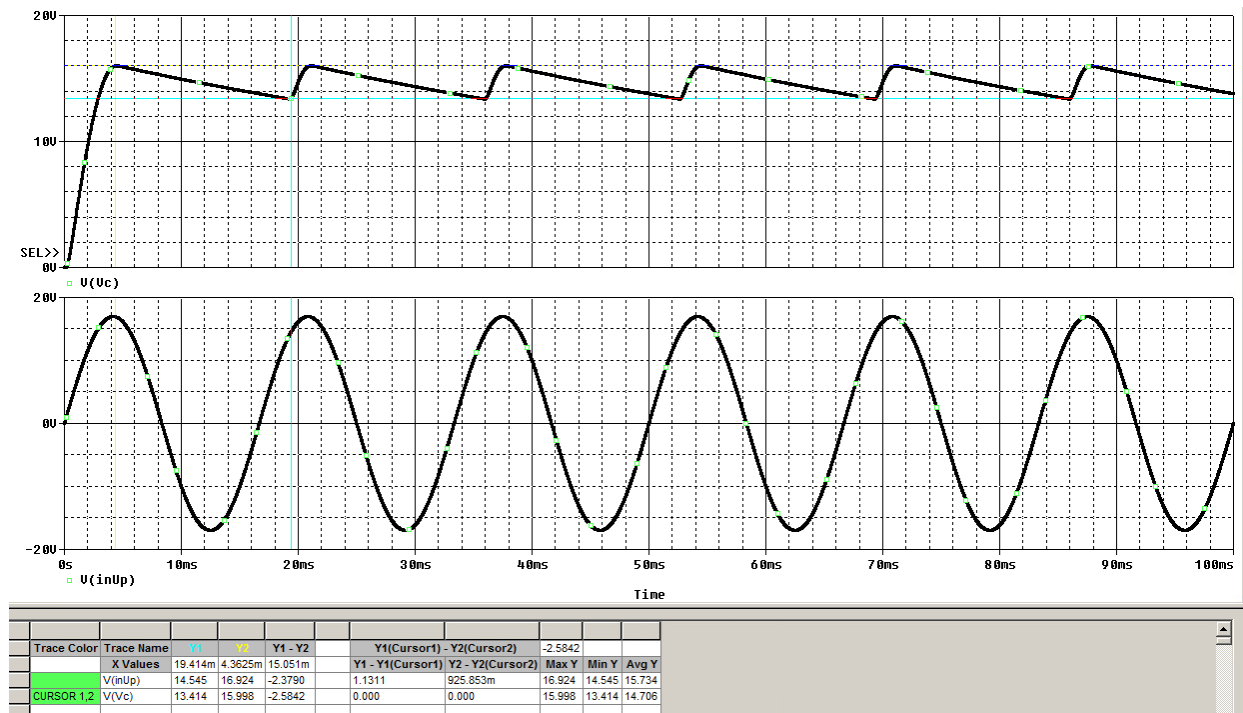
3.3)

$$\frac{5 - V_{Cmin}}{180} + \frac{5-0}{R_L} = 0$$

$$\frac{5 - 13.17}{180} + \frac{5}{R_L} = 0$$

$$0.04539 = 5/R_L$$

$$R_L = 110\,\Omega$$

$$R \leq \frac{V_{Cmin} - V_{ZO} - I_{Zmin}\, r_Z}{I_{Zmin} + I_{Lmax}}$$

$$V_Z = V_{ZO} + I_Z r_Z \qquad 5 = V_{ZO} + 1.2(0.015) \qquad I_L = I_{Lmax}$$

$$V_{ZO} = 4.982\,V \cong 5V$$

$$.180k\Omega = \frac{13.17 - 4.982 - 0.6(0.015)}{0.6 + I_{Lmax}}$$

$$I_{Lmax} = 44.84\,mA$$

$$I_L = \frac{V_Z}{R_L} = \frac{5}{R_L} = 44.84\,mA$$

$$R_L = 111\,\Omega$$

Trace Color	Trace Name	Y1	Y2	Y1 - Y2	Y1(Cursor1) - Y2(Cursor2)		44.853m		
	X Values	19.750m	0.000	19.750m	Y1 - Y1(Cursor1)	Y2 - Y2(Cursor2)	Max Y	Min Y	Avg Y
	V(Vz)	4.9338	4.8369p	4.9338	4.8889	4.8369p	4.9338	4.8369p	2.4669
	-I(D6)	5.9786m	5.2870f	5.9786m	-38.874m	5.2871f	5.9786m	5.2870f	2.9893m
CURSOR 1,2	-I(R2)	44.853m	-42.03E-21	44.853m	0.000	0.000	44.853m	-42.03E-21	22.426m