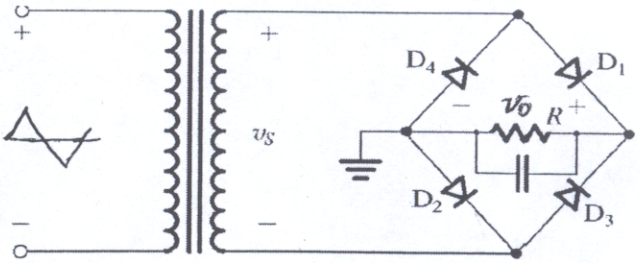
ECE3455, Q4) In the circuit shown, the input Vs is a **triangular** wave with amplitude of 3[V] and frequency of 100 [Hz]. If $V_{D(on)}$=0.7 [V] and R= 100 [ohms]:

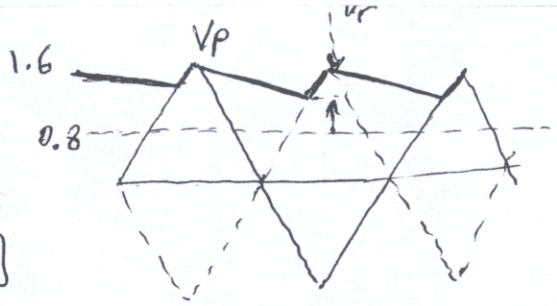
(a) Suppose capacitor is not in the circuit(C=0), find the average value of Vo.

(b) If C=500 microFarad, find the average value of V0.

(c) Find the conduction angle and the average current of each diode, regarding part(b).



Solution:



a) $V_p = 3 - 2\times 0.7 = 1.6\ [V]$

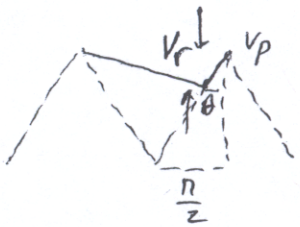
$V_{o(av)} = \frac{1}{2} \times 1.6 = 0.8\ [V]$

b) $V_r = \frac{V_p}{2 \times R_L \times f \times C} = \frac{1.6}{2\times 100 \times 100 \times 0.5\times 10^{-3}} = 0.16\ [V]$

$V_{o(av)} = V_p - \frac{1}{2} V_r = 1.6 - \frac{1}{2} \times 0.16 = 1.52\ [V]$

Thus the DC value of the output is increased by using Capacitor from 0.8 [V] to 1.52 [V].

c) $\frac{\theta}{\frac{\pi}{2}} = \frac{V_r}{V_p} = \frac{0.16}{1.6}$



$\theta = \frac{\pi}{2}\ rad = 9^\circ$ Conduction angle of diodes

$\frac{I_{av}^{(D)}}{I_L} = \frac{2\pi}{2\theta} \Rightarrow I_{av(D)} = \frac{360}{2\theta} \times \frac{V_p}{R_L} = \frac{360\times 1.6}{2\times 9\times 100}$

$I_L = \frac{V_p}{R_L} = \frac{1.6}{100} = 16\ mA$

$I_{D(av)} = 320\ [mA]$