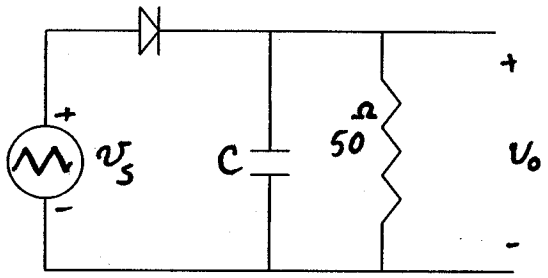
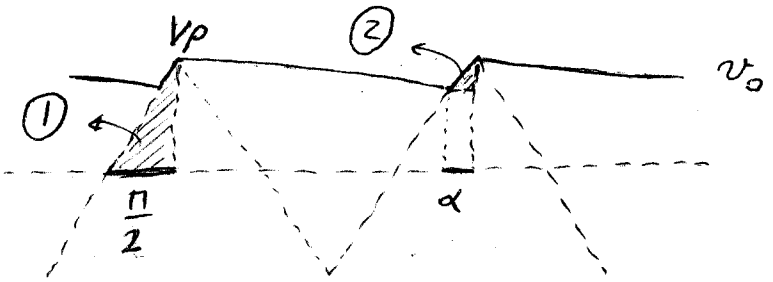
2-20 points) The average output voltage of the power supply shown, is 12 volts with one volt ripple(p-p). If the input voltage is triangular wave with frequency of 100 Hz, calculate,

a) The capacitor value.
b) The conduction angle of the diode.
c) The RMS value of the input voltage Vs.



Solution :



$$V_p = V_o(DC) + \frac{1}{2} V_r$$

$$V_p = 12 + 0.5 = 12.5 \ [V]$$

(a) $$C = \frac{V_p}{R \cdot f \cdot V_r} = \frac{12.5}{50 \times 100 \times 1} = \boxed{2500 \ MF}$$

(b) $$\frac{\alpha}{\frac{\pi}{2}} = \frac{V_p}{V_p} = \frac{1}{12.5}$$ from Similarity between triangle (1) and (2)

$$\alpha = \frac{\pi}{2 \times 12.5} = \frac{180}{2 \times 12.5} = 7.2^{\circ}$$

(c) $$V_s(P) = V_p + 0.7 = 12.5 + 0.7 = 13.2 \ [V]$$

In triangular waveform, the rms value is $\frac{1}{\sqrt{3}}$ of Peak Value

This relation Can be obtained by rms definition

$$V_s(rms) = \frac{V_s(P)}{\sqrt{3}} = \frac{13.2}{\sqrt{3}} = 7.62 \ [V]$$