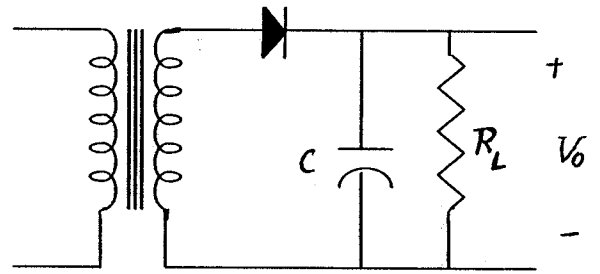


(A)

ECE3455, Q4) In the half-wave power supply shown, the secondary voltage of the transformer is 12 Vrms and the load resistor is 1 Kohm. The diode average current is 414 mA. Find

- The ripple voltage(pp).
- The DC value of the output voltage.
- The value of capacitor.  $f = 60 \text{ Hz}$



Solution: Since the secondary voltage of the transformer is  $V_s = 12 \text{ V (rms)}$

$$V_p = 12\sqrt{2} - 0.7 = 16.97 - 0.7 = 16.27 \text{ [V]}$$

The Load Current is about

$$I_L = \frac{V_p}{R_L} = \frac{16.27}{1000} = 16.27 \text{ [mA]}$$

We can find the angle of conduction of diode

$$I_D(\text{av}) \cdot \theta_D = 360 \times I_L = 360 \times 16.27$$

$$\theta_D = \frac{360 \times 16.27}{I_D(\text{av}) = 515} = 11.37^\circ$$

on the other hand  $\cos \theta_D = \frac{V_p - V_r}{V_p} = \cos 11.37^\circ = 0.98$

or  $V_r = 0.02 V_p = 0.319 \text{ [V]}$

b)  $V_0(\text{DC}) = V_p - \frac{1}{2} V_r = 16.11 \text{ [V]}$

c)  $C = \frac{V_p}{f \cdot R_L \cdot V_r} = \frac{16.27}{60 \times 10^3 \times 0.319} = 848 \text{ [}\mu\text{F]}$