

## Problems on Diodes (2)

45

$$r\% = 5\% = \frac{\text{RMS value of ripple}}{\text{DC value of output}} \cdot 100\%$$

$$V_{o(dc)} = 20 \text{ V}$$

$$\therefore \text{RMS value of ripple} = (V_{L,r})_{\text{RMS}} = 20 \times \frac{5}{100} = 1 \text{ V}$$

$$(V_{L,r})_{\text{RMS}} = \frac{V_{L,r,pp}}{2\sqrt{3}} \Rightarrow V_{L,r,pp} = 2\sqrt{3} = 3.464 \text{ V}$$

Peak value of output voltage  $V_{om} = V_{o(dc)} + \frac{1}{2} V_{L,r,pp}$

$$V_{om} = 20 + \frac{1}{2} \times 3.464 = 21.732 \text{ V}$$

$$V_{om} = n V_{im} \Rightarrow n = \frac{V_{om}}{V_{im}} = \frac{21.732}{120 \cdot \sqrt{2}} = 0.128$$

$$n = \frac{N_2}{N_1} \Rightarrow N_2 = n N_1 = 0.128 \times 100 = 12.8 \text{ turns}$$

$$V_{L,r,pp} = \frac{V_m}{f_0 R C} \Rightarrow C = \frac{V_m}{f_0 R V_{L,r,pp}}$$

$$C = \frac{21.732}{50 \times 500 \times 3.464} = 250.9 \text{ } \mu\text{F}$$

$$\text{PIV} \geq V_{om}$$

46.

$$V_o(\text{avg}) = 15 \text{ V}$$

$$r\% = 3\%$$

$$(V_{\text{ur}})_{\text{RMS}} = \text{RMS value of ripple} = 15 \times \frac{3}{100} = 0.45 \text{ V}$$

$$V_{\text{ur,pp}} = 2\sqrt{3} (V_{\text{ur}})_{\text{RMS}} = 1.5588 \text{ V}$$

$$V_{\text{sm}} = V_o(\text{avg}) + \frac{1}{2} V_{\text{ur,pp}} = 15 + 0.7794 = 15.7794 \text{ V}$$

total secondary voltage of transformer:

$$V_{\text{secondary-m}} = 2 V_{\text{sm}} = 31.5588 \text{ V}$$

$$n = \frac{V_{\text{secondary-m}}}{V_{\text{primary-m}}} = \frac{31.5588}{120\sqrt{2}} = 0.1859$$

$$V_{\text{ur,pp}} = \frac{V_m}{2f_0 RC} \Rightarrow (\text{assume } R = 1 \text{ k}\Omega)$$

$$C = \frac{V_m}{2f_0 R V_{\text{ur,pp}}} = \frac{15.7794}{2 \times 60 \times 1 \text{ k}\Omega \times 1.5588} = 84.35 \mu\text{F}$$

$$\text{PIV} \geq 15.7794 \text{ V}$$