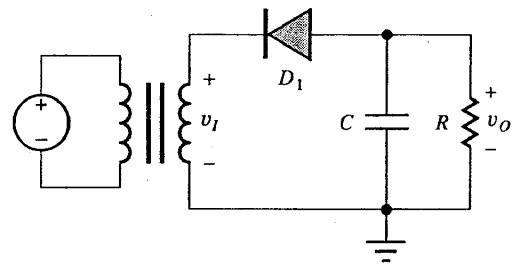
GIVEN:



$f = 60$ Hz

$v_I = 6.3\ V_{RMS}$

FIND: A) V_o IF $v_d = 1V$

B) C SO THAT $V_{RIPPLE} < 0.25V$ FOR $R = 0.5\Omega$

C) PIV FOR DIODE

D) I_{SURGE}

E) $I_{d,p}$ REPETITIVE

SOLN:

A) $V_{I,p} = \sqrt{2}(6.3) = 8.91\ V$

NOTE DIODE ORIENTATION ... WILL BE FWD DURING NEGATIVE HALF-WAVE ... SO

$$V_o = -8.91 - v_d = \underline{-7.91\ V}$$

B) $$C = \frac{7.91}{0.25}\left(\frac{1}{0.5}\right)\left(\frac{1}{60}\right) = \underline{1.05\ F}$$

C) $$PIV = 2V_p = \underline{17.8V}$$

D) $$I_{SURGE} = \omega C V_p = 2\pi(60)(1.05)(8.91) = \underline{3526.8\ A}$$

E) $$I_p = \frac{7.91}{0.5}\left(\frac{2}{\Delta T}\right)\left(\frac{1}{60}\right) = \underline{840\ A}$$

$$\Delta T = \frac{1}{\omega}\sqrt{\frac{2V_r}{V_p}} = \frac{1}{2\pi 60}\sqrt{\frac{2(0.25)}{8.91}} = 628\mu s$$

TOPS 35500

GIVEN: A HALF-WAVE RECTIFIER, 3.3V 30A

WITH $V_r < 2.5\%$ $f = 60$ Hz

FIND: A) C C) V_{RMS} FOR TRANSFORMER E) I_{SURGE}

B) PIV D) I_p

SOLN:

A) $C = \left(\frac{V_p - V_{ON}}{R}\right)\frac{T}{V_r} = \underline{6.06\,F}$

B) $PIV = 2V_p = \underline{8.6V}$

C) $V_{RMS} = \frac{3.3+1}{\sqrt{2}} = \underline{3.04\,V}$

D) $I_p = I_{dc}\frac{T}{\Delta T} = \underline{926A}$

$\Delta T = \frac{1}{\omega}\sqrt{\frac{2V_r}{V_p}} = \underline{0.520\,mS}$

E) $I_{SURGE} = \omega C V_p = \underline{9820\,A}$