ETEC 1120 Formula Sheet

General

$$\%\ \text{error} = \frac{|\text{measured} - \text{calculated}|}{\text{measured}} \times 100 \qquad R = \frac{V}{I} \qquad I = \frac{V}{R} \qquad V = IR$$

The Practical Diode

$$V_R = V_S - 0.7\,V \qquad I_T = \frac{V_S - 0.7\,V}{R_1} \qquad I_{F(max)} = \frac{P_{D(max)}}{V_F}$$

The Complete Diode

$$V_F = 0.7V + I_F R_B \qquad P_D = V_F I_F \qquad \text{Reverse Current } I_R = I_S + I_{SL}$$

The Zener Diode

$$Z_Z = \frac{\Delta V_Z}{\Delta I_Z} \quad | \quad \Delta V_Z = \text{the change in } V_Z \qquad I_{ZM} = \frac{P_{D(max)}}{V_Z}$$

Transformers

$$V_2 = \frac{N_2}{N_1} V_1 \qquad I_2 = \frac{N_2}{N_1} I_1 \qquad I_2 = \frac{V_1}{V_2} I_1 \qquad V_{(pk)} = \frac{V_{rms}}{0.707}$$

Rectifiers (Half Wave)

$$V_{L(pk)} = V_{2(pk)} - 0.7\ V \qquad I_{L(pk)} = \frac{V_{L(pk)}}{R_L} \qquad V_{ave} = 0.318\,V_{L(pk)} \qquad PIV = V_{2(pk)} \text{ (no filter)}$$

$$V_{2(pk)} = \frac{N_2}{N_1} V_{1(pk)} \qquad V_{ave} = \frac{V_{L(pk)}}{\pi} \qquad I_{ave} = 0.318\ I_{L(pk)} \qquad f_{out} = f_{in} \qquad I_{ave} = \frac{V_{ave}}{R_L}$$

Rectifiers (Full Wave)

$$V_{L(pk)} = \frac{V_{2(pk)}}{2} - 0.7\ V \text{ (center - tapped)} \qquad I_{ave} = \frac{2I_{L(pk)}}{\pi} \qquad V_{ave} = 0.636\,V_{L(pk)}$$

$$V_{L(pk)} = V_{2(pk)} - 1.4\ V \text{ (Bridge)} \qquad V_{ave} = \frac{2V_{L(pk)}}{\pi} \qquad I_{ave} = 0.636\ I_{L(pk)}$$

$$f_{out} = 2f_{in} \qquad PIV = V_{2(pk)} \text{-} 0.7\ V \text{ (no filter)}$$

Filter Capacitor

$$\tau = RC \qquad V_r = \frac{I_L}{fC} \qquad \text{Charge\Discharge Time } C = \frac{I(t)}{\Delta V_C} \qquad t = \frac{CV}{I}$$

$$T = 5(RC) \qquad V_r = \frac{I_L t}{C}$$

$$I_{surge} = \frac{V_{2(pk)}}{R_W + R_B} \qquad V_{dc} = V_{(pk)} - \frac{V_r}{2} \qquad PIV = 2\,V_{2(pk)} \text{ (half wave filtered)}$$

$$PIV = V_{2(pk)} \text{ (full wave filtered)}$$

Zener Regulator

$$I_Z = I_T - I_L \qquad I_L = \frac{V_Z}{R_L} \qquad R_{L(min)} = \frac{V_Z}{I_{L(max)}} \qquad V_{r(out)} = \frac{Z_Z \parallel R_L}{(Z_Z \parallel R_L) + R_S} V_r$$

$$I_T = \frac{V_S - V_Z}{R_S}$$