Ripple factor \( r = \frac{V_{\text{rms}}}{V_{dc}} \)

Load regulation = (no-load voltage - full-load voltage)/full-load voltage
(b)
\[ V_r(\text{rms}) = \left( V_{r_p} / 2 \right)^{0.5} \]

\[ V_{r_p} = \frac{V_{r_{pp}}}{2} \]

\[ V_{r_{pp}} = \frac{(I_{dc}/C)(T/2)}{T = 1/f} \]

\[ I_{dc} = \frac{V_{dc}}{R} \]
A full-wave rectifier circuit with 60Hz input drives a capacitor and a load. If \( C = 100\mu F \), \( RL = 2K \), and \( Vdc = 12V \) find the ripple voltage.

Find the maximum and minimum output voltages (should be easy).
(a) The diagram shows a circuit with a dc voltage level $V_{dc}$, a current $I_{dc}$, and a voltage $V'_{dc}$ across resistor $R$. Capacitor $C_1$ is shown with an annotation indicating the dc voltage level developed across it.

(b) The diagram illustrates an ac ripple voltage developed across capacitor $C_1$ with a notation $V_r (\text{rms})$. Capacitor $C_2$ is connected in parallel to the ac ripple voltage source, and the overall circuit is terminated with resistor $R_L$. The ac ripple voltage $V'_r (\text{rms})$ is indicated.
\[ V'_{r(rms)} \approx \frac{X_C}{R} V_r(rms) \]

- \( V'_{r(rms)} \) = ripple voltage after the RC filter
- \( V_r(rms) \) = ripple voltage before the RC filter
- \( R \) = resistor in the added RC filter
- \( X_C \) = reactance of the capacitor in the added RC filter

\[ \%V_R = \frac{V_{NL} - V_{FL}}{V_{FL}} \times 100\% \]

- \( V_{NL} \) = no-load voltage
- \( V_{FL} \) = full-load voltage
\[ V_{dc} = 150 \text{ V} \]
\[ V_r \text{ (rms)} = 15 \text{ V} \]

- Full-wave rectifier
- \( R = 500 \Omega \)
- \( C_1 = 15 \mu \text{F} \)
- \( C_2 = 10 \mu \text{F} \)
- \( R_L = 5 \text{ k}\Omega \)
A full-wave rectifier driven by household voltage 60Hz 115v\textsubscript{rms} feeds a 2000\textmu F capacitor in parallel with a 1000 ohm load. Determine the magnitude of the output ripple voltage.
Regulator

\[ V_i \] (unregulated input) → Control element → Sampling circuit → Comparator circuit → Reference voltage → Control element → \[ V_o \] (regulated output)

15_Power Supplies

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Determine the value of the output voltage in the circuit below:

\[ V_x = 10.7 \]
\[ I_x = \frac{V_x}{R_2} = \frac{10.7}{2.2k} = 4.86mA \]
\[ V_o = I_x \times (R_1 + R_2) = 4.86mA \times 5.5k = 26.75V \]
Current-limiting voltage regulator

![Diagram of a current-limiting voltage regulator with components labeled: $V_i$, $R_3$, $V_z$, $Q_1$, $R_{SC}$, $Q_2$, $R_1$, $R_2$, $R_L$, $I_L$, and $V_o$.]