Induction Machines

Slip

Locked/Blocked Rotor

\[ n_r = 0 \quad S = \frac{n_s - n_r}{n_s} = 1 \]
\[ f_r = 60 \text{ Hz} \]

Motor, Running Unloaded

\[ n_r < n_s \quad \text{ex: 4-pole 60 Hz} \]
\[ n_r = 1780 \text{ rpm} \]
\[ S = \frac{1800 - 1780}{1800} = 1.11\% \]
\[ f_r = S f_s = (0.011)(60) = 0.67 \text{ Hz} \]

Motor, Full Load

\[ n_r < n_s \quad \text{ex: 4-pole 60 Hz} \]
\[ n_r = 1730 \text{ rpm} \]
\[ S = \frac{1800 - 1730}{1800} = 3.89\% \]
\[ f_r = (0.0389)(60) = 2.33 \text{ Hz} \]

Generator

\[ n_r > n_s \quad \text{ex: 8-pole 60 Hz} \]
\[ n_r = 945 \text{ rpm} \]
\[ S = \frac{900 - 945}{900} = -0.05 = -5\% \]
\[ f_r = (0.05)(60) = 3 \text{ Hz} \]