Problem from book 7-5, 7-7, 7-11 as shown below.

7-5
A 50-kW 440-V 50-Hz two-pole induction motor has a slip of 6 percent when operating at full-load conditions. At full-load conditions, the friction and windage losses are 520 W, and the core losses are 500 W. Find the following values for full-load conditions:

(a) The shaft speed \( n_m \)

(b) The output power in watts

(c) The load torque \( T_{\text{load}} \) in newton-meters

(d) The induced torque \( T_{\text{ind}} \) in newton-meters

(e) The rotor frequency in hertz

7-7
A 208-V four-pole 60-Hz Y-connected wound-rotor induction motor is rated at 15 hp. Its equivalent circuit components are

\[
\begin{align*}
R_1 &= 0.220 \, \Omega \\
R_2 &= 0.127 \, \Omega \\
X_1 &= 0.430 \, \Omega \\
X_2 &= 0.430 \, \Omega \\
P_{\text{mech}} &= 300 \, \text{W} \\
P_{\text{mech}} &= 0 \\
P_{\text{core}} &= 200 \, \text{W}
\end{align*}
\]

For a slip of 0.05, find

(a) The line current \( I_L \)

(b) The stator copper losses \( P_{\text{SCL}} \)

(c) The air-gap power \( P_{\text{AG}} \)

(d) The power converted from electrical to mechanical form \( P_{\text{conv}} \)

(e) The induced torque \( T_{\text{ind}} \)

(f) The load torque \( T_{\text{load}} \)

(g) The overall machine efficiency

(h) The motor speed in revolutions per minute and radians per second

7-11
If the motor in Problem 7-7 is to be operated on a 50-Hz power system, what must be done to its supply voltage? Why? What will the equivalent circuit component values be at 50 Hz? Answer the questions in Problem 7-7 for operation at 50 Hz with a slip of 0.05 and the proper voltage for this machine.