EE 341 Homework #"last one" due Wed. 02 June 2004

7-2. A 220-V, three-phase, two-pole, 50-Hz induction motor is running at a slip of 5 percent. Find:
   (a) The speed of the magnetic fields in revolutions per minute
   (b) The speed of the rotor in revolutions per minute
   (c) The slip speed of the rotor
   (d) The rotor frequency in hertz

Note: Probs. 7.2 & 7.3 count as one problem.

7-3. Answer the questions in Problem 7-2 for a 480-V, three-phase, four-pole, 60-Hz induction motor running at a slip of 0.035.

7-14. A 440-V 50-Hz two-pole Y-connected induction motor is rated at 75 kW. The equivalent circuit parameters are
   \[ R_1 = 0.075 \, \Omega \quad R_2 = 0.065 \, \Omega \quad X_M = 7.2 \, \Omega \]
   \[ X_1 = 0.17 \, \Omega \quad X_2 = 0.17 \, \Omega \]
   \[ P_{	ext{ReW}} = 1.0 \, \text{kW} \quad P_{	ext{misc}} = 150 \, \text{W} \quad P_{	ext{core}} = 1.1 \, \text{kW} \]

For a slip of 0.04, find
   (a) The line current \( I_L \)
   (b) The stator power factor
   (c) The rotor power factor
   (d) The stator copper losses \( P_{\text{scl}} \)
   (e) The air-gap power \( P_{\text{AG}} \)
   (f) The power converted from electrical to mechanical form \( P_{\text{conv}} \)
   (g) The induced torque \( \tau_{\text{ind}} \)
   (h) The load torque \( \tau_{\text{load}} \)
   (i) The overall machine efficiency \( \eta \)
   (j) The motor speed in revolutions per minute and radians per second

(b) This should be the input power factor to the machine

DO NOT do (c), \( \text{pf}_{\text{rotor}} \)

Also include magnitude and angle of Thevenin’s equivalent impedance for the machine as “viewed” from \( V_\phi \) and \( I_L \).

Repeat Prob. 7-14 for a slip of -0.04, i.e., when acting as a generator.

Put the answers to Prob. 7.14 in a table for both slips.