



The Ohio State University
Department of Electrical Engineering

EE 341

Energy Conversion
Home work Set # 9

Print Your Name

The Last Four Digits of Your SSN:

1. Problem 7-5 on textbook (Chapman, page 444)

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 520W, and the core losses are 500W. Find the following values for full-load conditions:

- (a) The shaft speed n_m
- (b) The output power in watts
- (c) The load torque τ_{load} in newton-meters
- (d) The induced torque τ_{ind} in newton-meters
- (e) The rotor frequency in hertz

2. Problem 7-14 on textbook (Chapman, page 445)

A 440-V, 50-Hz, six-pole, Y-connected induction motor is rated at 75 kW. The equivalent circuit parameters are

$$\begin{array}{lll}
 R_1 = 0.082\Omega & R_2 = 0.070\Omega & X_M = 7.2\Omega \\
 X_1 = 0.19\Omega & X_2 = 0.18\Omega & \\
 P_{F\&W} = 1.3kW & P_{misc} = 150W & P_{core} = 1.4kW
 \end{array}$$

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_{SCL}
- (e) The air-gap power P_{AG}
- (f) The power converted from electrical to mechanical form P_{conv}
- (g) The induced torque τ_{ind}
- (h) The load torque τ_{load}
- (i) The overall machine efficiency η
- (j) The motor speed in revolutions per minute and radians per second