

Electrical Engineering Department

EE 360-01

Term 071

Sequence #

Quiz #5

Student Id #

Student name

A three phase 6-pole, 60 Hz, Y-connected induction motor delivers 20 kW of power at a slip of 4.5%. The motor has total rotational losses of 1500 W. Calculate the following:

- Rotor input
- Output torque
- Developed torque.

$$\textcircled{a} P_{\text{out}} = 20 \text{ kW}$$

$$P_{\text{dev}} = P_{\text{out}} + P_{\text{rot}} = 20 + 1.5 = \underline{21.5 \text{ kW}}$$

$$P_{\text{ag}} = \frac{P_{\text{dev}}}{1-s} = \frac{21.5}{1-0.045} = \underline{\underline{22.5 \text{ kW}}}$$

$$\textcircled{b} n_s = \frac{120f}{p} = 1200 \text{ rpm.}$$

$$n_r = (1-s)n_s = 1146 \text{ rpm.}$$

$$\omega_m = \frac{2\pi n_r}{60} = 120 \text{ rad/sec.}$$

$$T_{\text{out}} = \frac{P_{\text{out}}}{\omega_m} = \frac{20,000}{120} = \underline{\underline{166.7 \text{ N}\cdot\text{m}}}$$

$$\textcircled{c} T_{\text{dev}} = \frac{P_{\text{dev}}}{\omega_m} = \frac{21,500}{120} = \underline{\underline{179.2 \text{ N}\cdot\text{m}}}$$