Q1)

A 208-V four-pole 60-Hz Y-connected wound-rotor induction motor is rated at 30 hp. Its equivalent circuit components are

$R_1 = 0.100\ \Omega$ $R_2 = 0.070\ \Omega$ $X_M = 10.0\ \Omega$

$X_1 = 0.210\ \Omega$ $X_2 = 0.210\ \Omega$

$P_{\text{mech}} = 500\ \text{W}$ $P_{\text{misc}} \approx 0$ $P_{\text{core}} = 400\ \text{W}$

For a slip of 0.05, find

(a) The line current I_L

(b) The stator copper losses P_{SCL}

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

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

(e) The induced torque τ_{ind}

(f) The load torque τ_{load}

(g) The overall machine efficiency

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

Q2)

In the previous problem (Q1), what is the slip at the pullout torque? What is the pullout torque of this motor?

Q3)

A 460-V four-pole 75-hp 60-Hz Y-connected three-phase induction motor develops its full-load induced torque at **3.5** percent slip when operating at 60 Hz and 460 V. The per-phase circuit model impedances of the motor are

$R_1 = 0.058\ \Omega$ $X_M = 18\ \Omega$

$X_1 = 0.32\ \Omega$ $X_2 = 0.386\ \Omega$

Mechanical, core, and stray losses may be neglected in this problem.

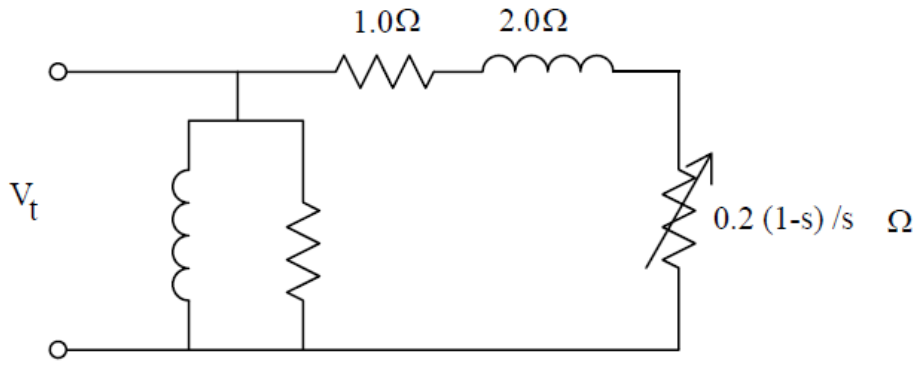
(a) Find the value of the rotor resistance R_2.

(b) Find $\tau_{\max}$, $s_{\max}$, and the rotor speed at maximum torque for this motor.

(c) Find the starting torque of this motor.

Q4) Problem 5-14 in the textbook

Q5)



three phase, 10 pole, Y connected, 60 Hz induction motor has the following equivalent circuit:
a. Find the motor rpm if the slip is zero, *i.e.* at synchronous speed.
b. Find the maximum torque when the motor is operated at 4160V.
c. Find the slip at maximum torque.
d. Find the rotor current frequency at this slip.
e. Find the magnitude of the starting current if the motor is operated at 4160 V. Neglect excitation current.
f. Find the magnitude of line to line voltage that will produce a starting torque of 4000 Newton-meters.
g. If the motor is operated in steady state at 4160 V and load torque is 4000 Newton-meters, find the motor speed in rpm. (Hint: Assume slip is small.)