

Problem 1

A 3ϕ , 10 hp, 460 V, 60 Hz, 4-pole induction motor runs at 1730 rpm at full-load. The stator copper loss is 200 W and the windage and friction loss is 320 W. Determine

- (a) The mechanical power developed, P_{mech} .
- (b) The air gap power, P_{ag} .
- (c) The rotor copper loss, P_{cu2} .
- (d) The input power, P_{in} .
- (e) The efficiency of the motor.

Problem 2

A 3ϕ , 100 kVA, 460 V, 60 Hz, eight-pole induction machine has the following equivalent circuit parameters:

$$R_1 = 0.07 \, \Omega, \quad X_1 = 0.2 \, \Omega$$

$$R'_2 = 0.05 \, \Omega, \quad X'_2 = 0.2 \, \Omega$$

$$X_m = 6.5 \, \Omega$$

- (a) Derive the Thevenin equivalent circuit for the induction machine.
- (b) If the machine is connected to a 3ϕ , 460 V, 60 Hz supply, determine the starting torque, the maximum torque the machine can develop, and the speed at which the maximum torque is developed.
- (c) If the maximum torque is to occur at start, determine the external resistance required in each rotor phase. Assume a turns ratio (stator to rotor) of 1.2.