EE4001, Induction Motor Quiz

**Student Name:** **Student Number:**

1. Sketch the torque-speed characteristic of the induction motor over the full speed range.

2. Sketch the per-phase steady-state equivalent circuit of the squirrel-cage induction motor.

3. Calculate the line current for operation at 50 % load at 400 V, 50 Hz, delta configuration, for the 315 kW, 4-pole machine (see attached).

4. What is your estimation for slip frequency (RPM) at this 50 % load point?

5. When the above 315 kW, 4-pole machine is running as a generator at full load and 50 Hz electrical, what is the rotor speed (RPM)?

6. Calculate the approximate output torque for the 315 kW, 4-pole machine when configured in star (Y) and supplied by 400 V(line-line)?

7. Consider the 30 kW, 4-pole machine. Estimate the per-phase magnetizing current at 400 V, full load.

8. Consider the 30 kW, 4-pole machine. Estimate the per-phase rotor current at 400 V, full load.

9. Consider the 30 kW, 4-pole machine. Estimate the per-phase rotor resistance.

10. Assuming simplistically that the startup impedance is limited by leakage inductance, and that resistance can be neglected, what is your estimation for rotor leakage inductance in the 30 kW, 4-pole machine assuming a 50-50 split of leakage inductance between rotor and stator?

11. Given the following parameters for the 22 kW, 4-pole machine: $L_M$ = 122 mH, $R_R'$ = 0.44 Ω, $R_S$ = 0.58 Ω, $P_{CFW}$ = 671 W, $L_{LS}$ = 2.9 mH, $L_{LR}$'= 4.3 mH. Calculate the 3-phase power measured by the meter if the measured phase current is 10.3 A during the no-load test.

12. Based on the above parameters for the 22 kW, 4-pole machine, what is the per-phase current in the locked-rotor test when the applied voltage is 54.7 V, 50 Hz, per phase.

13. What is the expected 3-phase power measured by the meter in the above locked rotor test.