Homework#4 – Due October 29, 2010

1. Courses notes. Problem 4.1.

2. Courses notes. Problem 4.2.

3. Problem 4.4:

(a) A two-phase induction motor is used as a brake with a DC voltage applied to winding A, while winding B is short-circuited. Using the expression for the steady-state torque, compute the torque and verify that the motor indeed acts as a brake. How does the braking torque compare to viscous friction? Compute the mechanical power absorbed by the motor.

(b) Using the expression for the impedance of the motor, compute the currents in stator windings A and B. What is the frequency of the stator currents? Compute the power absorbed by the DC power source. Does it make a difference whether winding B is open or short-circuited?

(c) Using the model in the stator frame, compute the currents i_{RA} and i_{RB}, and deduce i_{RX} and i_{RY}. What is the frequency of the (physical) rotor currents? How much power do the rotor currents dissipate as ohmic losses? What fraction of the mechanical power absorbed by the brake is dissipated in the rotor?