

- Problem 1. 33 pts. Consider a 3-phase induction motor. Starting with the phasor equivalent circuit, derive an expression for the phasor representing the a -phase rotor current in terms of the phasor representing the a -phase stator current, the radian slip frequency, and the lumped-circuit machine parameters.
- Problem 2. 34 pts. Consider a 3-phase salient permanent magnet ac machine. Starting from the machine qd voltage equations, the qd flux linkage equations, and the qd torque equation in terms of machine currents, derive an expression for steady-state torque in terms of the applied q - and d -axis voltage (in the rotor reference frame), the electrical rotor speed, and the lumped-circuit machine parameters.
- Problem 3. 33 pts. Consider a 3-phase synchronous machine with one damper winding in the q -axis. Starting with the qd machine model damper voltage equations and qd machine model stator and rotor flux linkage equations, find an expression for the time derivative of the q -axis damper flux linkage in terms of the stator and rotor q -axis flux linkages and the lumped-circuit machine parameters.

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