EE 280 Final - Review Checklist

Coverage: Anything covered in labs, lectures, reading, homework. The final is comprehensive, but will be more heavily weighted on material covered after the midterm. Refer to the Midterm Checklist for the material in the first part of the quarter. (Review any key concepts that you had difficulty with in the first part of the course - they will likely be on the final.) A listing of much of the material covered since then is provided as follows:

Concepts: know or be able to explain

- Ideal transformer
- Turns ratio, voltage ratio, current ratio
- Nonideal transformer behaviors
- Polarity markings, Lenz’s Law
- Winding resistance
- Leakage reactance
- Core loss resistance
- Magnetizing Reactance
- Approximate equivalent circuit
- Effective turns ratio of three-phase transformer
- “Closed” voltage phasor diagrams, PRI & SEC
- DC motors - construction and operation
- Excitation - self, separately, compound, series
- “Back EMF”
- Speed, induced voltage, flux, torque relationships
- Load characteristics
- Efficiency, losses
- Speed-Torque Characteristics
- DC motor starting
- Induction motor - how does it work?
- Squirrel cage vs. wound rotor
- Speed: actual, slip speed, synchronous
- Slip - starting, running, braking.
- Induction motor equivalent circuit
- Approximate Equivalent circuit
- Induction motor classes, codes
- Power - input, air gap, developed, output
- Losses - Stator, core, mechanical, rotor
- Rotor equivalents (RCL vs. $P_{DEV}$)
- Soft Starters, Resistive Starters
- Voltage Dip, power quality, harmonics
- Variable Frequency Drives (VFDs)
- Volts/Hz ratio
- Speed-Torque curves
- Matching motor with load
- Adding resistance to wound rotor
- Starting torque, max (pullout) torque
- Maximum slip
- Slip vs. efficiency

Calculations, Determinations:

- Calculate primary and secondary voltages and currents for single phase transformer.
- Calculate high- and low-side voltages and currents for autotransformer. Also volt-amp advantage.
- $V_1, I_1, V_2, I_2$. Voltage regulation, efficiency (for leading, lagging, unity PF)
- Refer impedances back and forth between primary and secondary of transformer
- Magnitude of line-line and line-neutral voltages on primary and secondary of 3-phase transformer.
- “Closed” voltage phasor diagrams of primary and secondary of 3-phase transformer.
- Calculate phase A phasor line current at load, for given MVA, voltage, PF.
- Delta-wye and wye-delta conversion of source, load.
- Calculate phasor voltage & current anywhere in a 3-phase transformer circuit.
- DC Motor: Calculate speed, induced voltage, flux, torque, efficiency, losses, etc.
- Induction motor: Calculate speed, slip, losses, efficiency.
- Calculate power & torque: in, air gap, developed, out.
- Calculate starting current 3 ways.
- Calculate $S_{MAX}$, $T_{MAX}$, $T_{START}$

Format: The test will be 5-6 pages long. Problems may be either calculation or short essay. Space for working problems is provided on the test - no additional sheets of paper (except for two sheets of notes/equations - one from midterm and one for final) are allowed on your desk. I have requested L103 for the exam, so seating should not be as close-packed as before. As before, we’d like to avoid having to deal with any MTU Academic Integrity concerns (i.e. cheating) so please focus on your own paper as much as possible. Avoid talking and wearing baseball hats or dark glasses. If you have a question, raise your hand and clear your throat and I’ll come directly to your desk.