EE 280 - Test 4 Review Checklist

Coverage: Anything covered to date in labs, lectures, reading, homework. A large listing of the material covered since last test (which is not necessarily complete) is provided as follows:

Concepts: know or be able to explain

- Phasor analysis, Euler’s Identity
- Double-subscript notations
- Labeling V & I: Passive vs. Active elements
- Peak vs. RMS magnitudes
- Phasor value vs. RMS magnitude vs. angle
- Power Triangle, Impedance Triangle
- Leading vs. Lagging PF, PF angle θ
- Power: Apparent, Average, Reactive
- Single-Phase vs. Three-Phase Circuits
- Positive vs. Negative sequence
- Voltages: L-N, L-L (“line”), phase voltage in Y or Δ
- Currents: phase currents in Y or Δ, line currents
- Balanced 3-phase loads: Y or Δ or “black box”
- Balanced 3-phase sources: Y or Δ or “black box”
- Power factor correction - why and how
- Voltage phasor diagrams: “open” vs. “closed”
- Per phase analysis
- Leakage reactance
- Core loss resistance
- Magnetizing Reactance
- Magnetic Saturation
- stacking factor or (lamination factor)
- Why use laminations?
- Ideal transformer
- Turns ratio, voltage ratio, current ratio
- Nonideal transformer behaviors
- Voltage phasor diagrams: “open” vs. “closed”
- Winding resistance
- DC motors - construction and operation
- Linear motor, induced voltage, induced torque
- Excitation - self, separately, compound, series
- “Back EMF”
- Speed, induced voltage, flux, torque relationships
- Load characteristics
- Efficiency, losses
- Speed-Torque Characteristics
- DC motor starting
- Wind Power

Calculations, Determinations:

- Calculations involving V, I, P, Q, S, Z, R, X, θ, φ for single phase 60-Hz circuit
- Calculate V, I, PF, S, P, Q, using phasor diagrams and power triangles as visual aid.
- Delta to Wye and Wye to Delta conversion of sources using closed voltage phasor diagram.
- Delta to Wye and Wye to Delta conversion of loads, equivalent black box representation.
- Use of closed voltage phasor diagrams to obtain equivalent L-N and L-L voltages
- Calculate line currents between single-phase or 3-phase sources and loads.
- Determine phase voltages and currents for any Y or Δ source or load.
- Determine phasor line currents flowing into “black box” load. Draw power triangle, calculate P, Q, S, θ.
- Wind Power: Calculate force, power, converted electrical energy vs. wind speed, air density, etc.
- DC Motor: Calculate speed, induced voltage, flux, torque, efficiency, losses, etc.
- Linear Motor: Calculate induced voltage, torque, velocity, etc.

Format:

The test will be 3-4 pages long. Problems may be either calculation or short explanation. Space for working problems is provided on the test - no additional sheets of paper (except for one equation sheet) are allowed on your desk. Test seating is close-packed, but please spread out as much as possible. As a professor at MTU, I’ve have not so far had to report cheating on any of my exams. However, to avoid having to deal with MTU Academic Integrity concerns (i.e. cheating) please focus on your own paper as much as possible. Avoid talking and wearing baseball hats or dark glasses. If you have questions, please raise your hand and clear your throat if you need to get attention.

Preparation Hints:

This is a 30-minute timed test. Please come early and get situated. The test will be handed out at precisely 5 minutes after the hour, and collected at precisely 35 minutes after the hour. If you’ve come to every class, studied the handouts, reading assignments, and recommended web pages, and done the homework and labs, you should be well-prepared for the test. No partial credit can be given if work is not shown – it helps to show the equations used, sketch the circuit, label things, and make note of assumptions.

Your equation sheet can help you to recall an equation or concept that you already understand.
Unfortunately, you’ll not have time to figure out concepts “on the run” during the test. I strongly encourage you to put time in on the course on an ongoing basis, and avoid cramming the night before each test. Ideally, the night before the test should involve a relaxed review of lecture notes, homeworks, and reading assignments.

For the “short explanation” questions, give a concise explanation based on cause and effect and other interrelationships (i.e. don’t just recite unconnected facts – how do the “pieces” fit together and why?) Two or three short sentences and a simple sketch or equation should be sufficient.