EE 380 - Test 1 Review Checklist

Coverage: Prerequisite material on phasor analysis, plus anything covered to date in lectures, reading (book and handouts), and homework. A large listing of the material (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 \( \theta \)
- 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 \( \Delta \)
- Currents: phase currents in Y or \( \Delta \), line currents
- Balanced 3-phase loads: Y or \( \Delta \) or “black box”
- Balanced 3-phase sources: Y or \( \Delta \) or “black box”
- Voltage phasor diagrams: “open” vs. “closed”

- Per phase analysis
- Ideal transformer
- Turns ratio, voltage ratio, current ratio
- Nonideal transformer behaviors
- Polarity markings
- Winding resistance
- Single Phase Per Unit System
- Base values
- Establishing base values throughout a system
- Manufacturer’s per unit and base values for a piece of equipment, as opposed to system-level base and per unit values.

Calculations, Determinations:

- Calculations involving V, I, P, Q, S, R, X, \( \theta \), \( \phi \) 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 \( \Delta \) source or load.
- Determine phasor line currents flowing into “black box” load. Draw power triangle, calculate P, Q, S, \( \theta \).
- Calculate V, I, P, Q, S, Z, R, X, \( \theta \), \( \phi \) for 3-phase transformer bank.
- Converting V, I, P, Q, S, Z, R, X from actual to per unit for Generator, transformer, load, line.
- Converting per unit impedances from on base to another.
- Calculating V, I in per unit.
- Converting per unit values of V and I back into actual volts and amps.

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. To avoid having to deal with MTU Academic Integrity concerns (i.e. cheating) please focus on your own paper as much as possible. Take off your baseball cap or rotate it to the back. No dark glasses or talking. If you have a question, please raise your hand and clear your throat if you need to get attention.

Preparation Hints:

The test will be designed to be worked in 40 minutes. Please come early and get situated. The test will be handed out at precisely 5 minutes after the hour, and collected at precisely 45 minutes after the hour. If you’ve come to every class, studied the handouts, reading assignments, recommended web pages, and done the homework, 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.

A 5” x 8” equation card can be used during the test. Place your name on the upper right corner of the card. Equations in algebraic form, sketches of sample circuits, and “typical” phasor diagrams are allowed. Things that are not allowed are: pre-written answers to anticipated essay questions, worked-out problems, and
Keep in mind that the purpose of the equation card is to help you recall a concept or non-obvious equation that you already understand. Unfortunately, you’ll not have time to figure out concepts “on the run” during the test. You are strongly encouraged 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 perhaps a simple sketch should be sufficient.