EE 3120 - Test 1 Review Checklist

Coverage: Anything covered to date in lectures, reading mat'l in text and on web page, homework, and quizzes. A large listing (which is not necessarily complete) is provided as follows:

Concepts: understand and be able to explain

- Energy in wind vs. temp, pressure, elevation
- Betz coefficient
- Shadowing effect, turbulence, vibrations
- Name and function of parts of wind generator
- 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

• Ampere’s Circuital Law $\mathcal{F} = \mathcal{N} = \mathcal{R} \phi$
• Magnetic Permeability $\mu = \mu, \mu_0$
• Mean path length
• Cross-sectional area
• Magnetic Reluctance $\mathcal{R}$, Permeance $\mathcal{P}$
• Magnetic Flux, $\phi$
• Magnetomotive Force, MMF or $\mathcal{F}$
• Magnetic Flux Density, $B$
• Magnetic Flux Intensity, $H$
• Flux Linked $\lambda$
• Inductance $L$
• Fringing around air gap, leakage
• Magnetic Saturation
• Why use laminations?
• 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

Calculations, Determinations:

- Power in wind: available, maximum extractable, realistic (after efficiencies are accounted for)
- Delta to Wye and Wye to Delta conversion of sources and loads
- 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.
- Per phase analysis
- Determine phasor line currents flowing into “black box” load.
- Calculate V, I, PF, S, P, Q, using phasor diagrams and power triangles as visual aid.
- Power factor correction (using power triangle for calculations)

Format: With larger sections it is unfortunately necessary to establish a clear detailed test-taking procedure. Here is what to expect:

The test will be 4-6 pages long, with a cover sheet. The test is designed to be a 50-min test, but if everyone is in place on time, we can have as much as 60 minutes. Do not open the test booklet, look at problems, or begin to work on it until everyone has received one and you are told to begin. Problems may be either calculation or short essay. Space for working problems is provided on the test - no additional sheets of paper (except for one hand-written sheet of notes/equations) are allowed on your desk. Your note sheet can contain equations and notes about important concepts. Complete example problems with solutions that can be copied are not allowed. A stapler will be provided - when you hand in your test, staple the note sheet to the back.

Sit in every other seat in each row, forming columns. To avoid any MTU Academic Integrity concerns (i.e. cheating) it is best to avoid questionable situations. So, please focus on your own paper as much as possible, and avoid talking or staring eyes. It’s ok to wear a baseball cap, but turn the brim backwards. Avoid wearing dark glasses. If you have a question, raise your hand and clear your throat and I’ll come directly to your desk. Questions are encouraged – if there is a typo or a clarification, I will share it with the whole class.