EE 3120 - Test 2 Review Checklist

Coverage: Anything covered since Test 1. All Lectures, material in text from Section 4.7 onward, info posted on web page, course handouts, homework, and quizzes. You continue to be responsible for circuit analysis concepts used throughout this course. A large listing (which is not necessarily complete) is provided as follows:

Concepts: be able to explain and apply
- Solar Energy AM numbers
- Solar Cells/Panels: \( V_{OC}, V_{MP}, I_{SC}, I_{MP}, J_{SC}, FF \)
- Diode equation for PV junction
- Characteristic curve, Max Power Point
- Battery electrolyte and plate materials
- Battery plate reactions - acid vs. alkaline
- Fuel cells: PEM, fuel, chemical reaction
- Double-subscript notations, active vs. passive
- Power Triangle, Impedance Triangle
- Leading vs. Lagging PF, PF angle \( \theta \)
- Power: Apparent, Average, Reactive
- 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”
- Power factor correction - why and how
- Voltage phasor diagrams: “open” vs. “closed”
- Per phase analysis

Calculations, Determinations:
- Phasor Analysis Methods Used Throughout:
  - Calculations involving \( V, I, P, Q, S, Z, R, X, \) for single phase 60-Hz circuit
  - Calculate \( V, I, PF, S, P, \) using phasor diagrams and power triangles as visual aid.
  - Calculate phasor line currents flowing into single-phase or 3-phase sources and loads.
  - Determine phasor line currents flowing into “black box” load.
  - Per phase analysis of 3-phase circuits
- Relate solar cell maximum power to FF, \( V_{OC}, V_{MP}, I_{SC}, I_{MP}, \eta \)
- Designing solar array to supply a load of given current and voltage
- Calculate \( V, I, P, Q, S, Z, R, X, \) for 3-phase transformer bank, delta and wye connections.
- Linear Motor: Calculate induced voltage, torque, velocity, etc.
- Power factor correction: by adding capacitors or by adding synchronous motor.
- Synchronous Machines - synchronous speed, torque, power, torque angle \( \delta \), \( E_A, I_A, V_T \)
- Synchronous Machines - Pout and Qout as function of delta
- Voltage regulation: in general and related to synchronous generator

Format: 4 pages plus 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 worked-out 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 straying 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, we need to immediately share it with the whole class.