

# 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 follows. As mentioned in class, material coverage is essentially everything thru section 9.2, except for Chapter 8. Chapter 8 material has not been covered, except for a basic safety lecture given on Jan 20th. (Note that mat'l on section 9.3 will appear in Test 2).

**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  $\theta$
- Power: Apparent, Average, Reactive
- Single-Phase vs. Three-Phase Circuits
- Positive vs. Negative sequence
- Voltage phasor diagrams: "open" vs. "closed"
- 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"
- Solar Energy AM numbers
- Active vs. passive solar
- Solar Cells/Panels:  $V_{OC}$ ,  $I_{SC}$ ,  $V_{MP}$ ,  $I_{MP}$ ,  $J_{SC}$ , FF
- Diode equation for PV junction
- I-V Characteristic curve, Max Power Point
- Light intensity, luminosity, wavelengths.
- Fuel cells: PEM, fuel, chemical reaction
- Hydro generation: impoundment, diversion.
- Pumped storage.
- Hydraulic head, Bernoulli's Eqn.
- Geothermal energy
- Coal-fired power plants, heat rate.
- Nuclear Power Plants. BWR vs. PWR.
- Cooling towers
- Steam cycle for steam turbines.
- Pros and cons of various energy sources.

**Calculations, Determinations:**

- Power in wind: available, maximum extractable, realistic (after efficiencies are accounted for)
- Solar Cells/Panels:  $V_{OC}$ ,  $I_{SC}$ ,  $J_{SC}$ ,  $P_{MP}$ , FF, diode equation:  $I_L$ ,  $I_{LOAD}$ ,  $I_{DIODE}$ .
- Solar Cell energy conversion: luminosity, light intensity,  $\eta$ ,
- Designing solar array to supply a load of given current and voltage.
- Heat rate vs. efficiency for fossil-fuel power plant.
- Delta to Wye and Wye to Delta conversion of sources and loads
- Use of closed voltage phasor diagrams to graphically 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.
- Calculate V, I, PF, S, P, Q, using phasor diagrams and power triangles as visual tools.

**Format:** With larger sections it is unfortunately necessary to establish a clear detailed test-taking procedure. We will do the same as was done for the Pre-Req test. 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/explanation. 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. Not allowed are complete problems with solutions that can be copied. 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 possible appearance of MTU Academic Integrity concerns (i.e. cheating) it is best to just 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 is needed, then it's best to share it with the whole class as soon as possible.