EE 380 - Test 2 Review Checklist
(Date of this Draft: 19 Jan 2000)

Coverage: Basically, all material related to Chapters 3 and 4 (except for sections 4.8 thru 4.10). Also, anything covered to date in lectures, reading (book, handouts, and recommended URLs), and homework. Much of this material is listed below to refresh your memory. This list is not guaranteed to be complete, but should be nearly so.

Concepts: know and be able to explain

- All pre-requisite circuit analysis skills.
- Phasor analysis pre-requisites
- Single-phase and three-phase circuits
- Definition of loads: P, Q, S, PF, efficiency
- Motors: induction vs. synchronous
- Power Factor Correction - why and how
- Capacitor sizing
- Real-time control of synchronous motor
- Utility factor, system reliability, FERC
- Distribution system layouts: Radial, loop, combination, networks
- Overhead vs. underground distribution - pros and cons.
- Line losses, how PF affects
- Typical operating voltage levels
- Transformer construction - core and windings
- Core laminations - why?
- Hysteresis and Eddy current losses
- Winding resistance and leakage reactance
- Transformer equivalent circuit
- Transferring impedances back and forth between primary and secondary
- Exciting current, magnetizing current, core loss current
- Harmonics in exciting current, power quality
- Voltage vs. flux-linked in transformer.
- Inrush current, damping effect of \( R_{EQ} \)
- Three-phase transformer connections
- Types of distribution transformer connections: center tapped, wild leg, etc.
- Autotransformers
- Autotransformer rating advantage (also called "Volt-Amp" advantage). CT and PT (PT is today correctly called VT).
- Voltage regulation
- Effect of loads of varying PF on voltage regulation

Calculations, Determinations:

- Calculations involving V, I, P, Q, S, Z, R, X, \( \theta \) for single phase 60-Hz circuit
- Calculate V, I, PF, S, P, Q, 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. Draw power triangle, calculate P, Q, S, \( \theta \).
- Power factor correction, by adding capacitors or by adding synchronous motor.
- Calculation of value of correction capacitor (either as \( X_C \) (Ohms) or in \( \mu \)F).
- Autotransformer circuits, either step-up or step-down.
- Voltage regulation related to line sections (as in Fig. 3.7) or transformers (as in Section 4.7)
- Calculate ratios needed for CT and VT

Format and Proctoring of Test:

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 5” x 8” note card) are allowed on your desk. Test seating is close-packed, but please spread out as much as possible. To avoid MTU Academic Integrity concerns (i.e. cheating) please focus on your own paper. Take off your baseball cap or rotate it to the back. No dark glasses, talking, or glances at other test papers. If you have a question, please raise your hand. Clear your throat if you need to get attention. Don’t hesitate to ask your professor questions during the test. If there is a typo or if a clarifying hint can be given, your professor will notify the entire class, usually by writing it on the board.

Preparation Hints:

The test will be designed to be worked in 40 minutes. Please come early and get situated. The room is open during the preceding hour, so you can come in at 8am to study if you wish. If he’s available, the professor may also come early to answer your pre-exam questions.

There will be a cover sheet on the test. Put your name on the cover sheet in bold capital letters. Don’t open the test until you get the go-ahead, at approximately 5 minutes after the hour. If you’ve come to every class,
studied the handouts, reading assignments, recommended web pages, done the homework, and understand
the pre-requisite material from EE 232 and EE 280, you will be very 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
photocopied (or laser-printed) equation cards used by groups of students.

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.

Lastly, remember, there’s a review session on Thursday evening at 7pm. Check your e-mail tomorrow for
confirmation of room number.

Hope you all do well on the test. See you Friday morning.