Coverage: The final exam is comprehensive. All material covered in reading assignments, homework, quizzes, lectures, and the first 3 hour tests could appear. Refer to the Review Checklists for the first 3 Tests.

In addition, the material covered since Test 3 could also appear. All sections in Ch.7 should have been read by now. Section 7.6 is the only calculation type problem, for total load in an industrial facility. In Ch.8, focus on sections 8.1 (Homework H4.1 is one small aspect of SCADA -- see Fig. 8.6 and locate the Analog Data Measuring Equipment and A/D converters, and 8.4. Skim the remaining sections of Ch.8 to get an idea of some issues involving generation and transmission of electric energy. The study questions at the end of each chapter are very helpful in focusing on the key topics.

Topics to focus on are:

a) Important topics (key concepts)
b) Material that did not appear on the first 3 tests.
c) Material covered/read/homework since Test 3.

A few topics that come to mind are: per unit, all types of three phase circuit calculations, three phase transformer connections, short-circuit currents that CB must interrupt, etc.

Concepts: refer back to sheets from first 3 tests. Also, a couple of things covered since then are:

• Tap and time dial setting for time-overcurrent relay.
• Overcurrent relays & fuses - time inverse curve
• Fuses - melt time vs. clear time
• Coordination time interval (CTI)
• Breaker operate time
• Maximum load current, min and max fault current.
• Coordination of relays, fuses on radial line.

Calculations, Determinations:

• Calculations involving V, I, P, Q, S, Z, R, X, θ, φ 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, θ.
• Voltage regulation related to line sections (as in Fig. 3.7) or transformers (as in Section 4.7)
• Voltage dip
• Calculate ratios needed for CT and VT
• X/R ratio, time constant, and short-circuit current: AC, DC, and total (true) RMS
• Time-Overcurrent (IEEE type 51 relay) Relay coordination

Format and Proctoring of Test:

The test will be approximately 5 pages long and approximately 125-150 points. Problems may be either calculation or short explanation. Space for working problems is provided on the test - no additional sheets of paper (except for your note cards) 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:

There is a 2-hour test period. Those who are thoroughly prepared should be able to work the test in approximately 90-100 minutes. Please come early and get situated. The room is open during the preceding 15 minutes, so come early and get situated and ready.

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 from the test proctor. 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. If you

The three 5" x 8" equation cards from the first tests can be used. One additional card can be made up for material that is on the final. Place your name on the upper right corner of the card, and also label each card “Test 1,” “Test 2,” “Test 3,” and “Final.” 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 printed equation cards used by groups of students.

Keep in mind that the purpose of the equation cards 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.

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.

Let me know if there’s anything else I can do to help you prepare for the Final. Hope you all do well. See you Tuesday.