Review: Tuesday, _____ pm on zoom

Final Exam: Monday, 12/11, 1:00 pm in regular classroom

Arn will be in WEB L103 Friday, 12/15, 8:00am - 10:20 for ECE2210 Final

First part of Exam is **Closed book, Closed notes, No calculator**, ~ 0 - 90 points.

The second part will be **Closed book,** except for the note sheets handed out in class for exams 1, 2, 3 and Final. You may add to these sheets. The second part will be problems. Total: 180 points, both parts.

The exam will cover   Possible questions

1. Material from Exam 1, 2, & 3   Study the questions
                                                        from midterms

2. HW 1 AC steady-state review, used extensively throughout class

3. HW 2 RMS & **Single-phase AC power**.   Possibly part of 3ϕ problem   Basic relationships and units

   P Q **S** $|\mathbf{S}|$ pf   correction of pf

4. HW 3 Energy sources, plant efficiencies   Lots possible

5. **HW 4 & 5 3-phase AC power.**   Basic magnitude and
                                                        phase relationships

   $\mathbf{V_L}$ $\mathbf{V_{LL}}$ $\mathbf{V_{LN}}$ $\mathbf{I_L}$ $\mathbf{I_{LL}}$ $\mathbf{I_Y}$ $\mathbf{S_{3\phi}}$ $\mathbf{S_{1\phi}}$

   $\mathbf{Z_Y} = \dfrac{\mathbf{Z_\Delta}}{3}$ $\mathbf{Z_\Delta} = 3 \cdot \mathbf{Z_y}$ pf   correction of pf

6. HW 6 Magnetic circuits   Flux density, Field intensity,
                                                        Permeability, B-H curve. effects
   $B = \mu \cdot H$ $H = \dfrac{N \cdot i}{l_m}$ of nonlinearity on some currents
                                                        (3rd harmonic).

7. HW 7 - 9 Transformers   Basic relationships

   Calculations   losses, ideal/non
                                                        construction, ratings,
   Impedance transformation   magnetization reactance,
   OC & SC Tests --> model   core losses, winding losses,
                                                        leakage reactance.
   η & VR

   Autotransformers   Autotransformers

   3ϕ Transformers Δ & 3rd harmonic   Y or Δ

8. One-Line Diagrams, variations and Per-Unit analysis   Common symbols, why PU

   Base Values S_{base} V_{base} I_{base} Z_{base} Bases, why and when do
                                                        they change
   Basic per-unit modeling and calculations
                                                        Why per-unit?

9. Motor Basics   Terms, Stator, Rotor, etc.
                                                        Armature, Field, back EMF
                                                        Torque, Speed, Power
                                                        Friction, Windage
                                                        Slip rings, brushes

10. HW SG1 & SG2 Synchronous generators and motors   Basic relationships

    Know the phasor diagram!   losses, construction,
                                                        limits, operation

11. HW Ind1 - Ind3 Induction motors

Know the model!

Powers P_{AG} P_{conv} P_{out} etc. η

Torque & speeds

Types & effect of R_2

Basic relationships

Poles, slip, why, how

Typ torque-speed curves

12. Single phase induction motors

Types of starting methods

Centrifugal switches

Phase modification for start winding

Calculation of Impedances and Capacitors

Single phase starting

Magnetic fields

Starting direction

Optimal Phase difference

Not covered in previous exams

13. **DC motors**

Know the model!

Powers P_{conv} P_{out} etc. η

Torque & speeds

Series-wound & universal motors

Basic relationships

Torque-speed curves

14. **Motor Load types & Torque-speed curves**

Especially in relation to DC motors

15 **Transmission Lines**

Short, **Med**, Long Z_C

Series impedance $\mathbf{Z}_{series}$ Shunt admittance & $\dfrac{\mathbf{Y}_{shunt}}{2}$

Shunt impedance & $2 \cdot \mathbf{Z}_{shunt}$

Models and calculations

Basic relationships

Common line voltages

Short, Med, Long   mi, km

What is & why use bundling

16. **Power Flow**
Possibly a simple admittance matrix or part of one

See notes that were handed out, many possible questions

System requirements

Assumptions

Bus types

17. **Transmission line Faults**

Know the component sequences and how they are used to analyze unbalanced systems. I May give the basic matrix equations and then ask how one of the four faults is reduced to series and/or parallel component circuits (see Transmission Line Faults notes, p.3 - 9). May ask for some detail from those notes (say why something can be neglected in some case).

Also review how the impedances differ for the 3 sequences.

Types of faults

18. **Protection**   **questions**

19. All homeworks, but especially **DC1 through Prot**

20. All Labs   questions

21. All Field trips   questions

ECE 3600   Final Exam Study Guide p2   **Bolded items are more likely**