Topics for Today:

• Announcements
  • Help session hrs: 4:05-5:55pm W,F - EERC 123
  • Office: EERC 614. Phone: 906.487.2857
  • Recommended problems from Ch.3, solutions posted

• Transformers and circuits w/transformers
  • Paralleling of transformers
    • Proportioning of MVA flow for unequal MVA size, unlike impedances
    • Circuit calculations for above cases
    • Design and operations issues
  • Phase shifting transformers
  • Remaining topics will be covered again in context of system operation & analysis, i.e. Chapters 7 and 8. We can introduce main concepts here:
    • Per phase Pi-equivalent for off-nominal turns ratio, phase shifts, etc.
    • Incorporation in system admittance matrix for short-circuit and load flow
Synchronous Machines - Chapter 3

- Recommended problems & solns for Ch.3 are posted.
- Phasor diagrams - unity, lag, lead
- Salient rotor machines - calculation with Xd and Xq.
- Calculation Example(s)
- P & Q flows thru transmission lines
- More on admittance matrix [Y] construction
Screw moves

\[ \mathbf{A} \times \mathbf{b} \]
DO NOT ATTEMPT TO HANDLE, INSTALL, USE OR SERVICE THIS TRANSFORMER BEFORE READING INSTRUCTION BOOK XLL7952-12. TO DO SO MAY LEAD TO BODILY INJURY OR PROPERTY DAMAGE OR BOTH.
Admittance Approaches

\[ \begin{bmatrix} \bar{y}_{11} & \bar{y}_{12} \\ \bar{y}_{21} & \bar{y}_{22} \end{bmatrix} \begin{bmatrix} \bar{V}_1 \\ \bar{V}_2 \end{bmatrix} = \begin{bmatrix} \bar{I}_1 \\ \bar{I}_2 \end{bmatrix} \]

\[ \text{injected!} \]
2-port theory

- H param (electronics)
- ABCD params
- Admittance Matrix
Tap Changing \( Y_{FMRS} - \) Variations (p.u. representations)

"From" Bus

\[ Y_{sc} \]

\[ (R+jX) \]

\[ 1:1 \]

"To" Bus

\[ Y_{sc} \]

\[ 1:1 \]

\[ Y_{sc} \]

\[ (R+jX) \]

1. \( C \) is off-nominal turns ratio. In general, \( C \) is complex.

2. \( C \) is real for LTC.

3. \( C \) is complex for PS.

4. If \( |C| \neq 1 \) then magnitude change.

If \( C \) is complex, phase shift.

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