Reading: Chapters 3 and 5.
Due Date: Thursday October 11, 2012

Problem 1. A 500-km, 500-kV, 60-Hz uncompensated three-phase line has a positive-sequence series impedance \( z = 0.03 + j0.35 \ \Omega/km \) and a positive-sequence shunt admittance \( y = j4.4 \times 10^{-6} \) S/km. Calculate:
(a) \( Z_c \)
(b) \( (\gamma l) \)
(c) The exact ABCD parameters for this line.

Problem 2. A 320-km 500-kV, 60-Hz three-phase uncompensated line has a positive-sequence series reactance \( x = 0.34 \ \Omega/km \) and a positive-sequence shunt admittance \( y = j4.5 \times 10^{-6} \) S/km. Neglecting losses, calculate:
(a) \( Z_c \)
(b) \( (\gamma l) \)
(c) The exact ABCD parameters for this line.
(d) The wavelength \( \lambda \) of the line, in kilometers.
(e) The surge impedance loading in MW.

Problem 3. The following data are obtained when open-circuit and short-circuit tests are performed on a single-phase, 50-kVA, 2400/240-volt, 60-Hz distribution transformer

- **Measurement on low-voltage side with high-voltage winding open.**
  Voltage: 240 V. Current: 5.97 A. Power: 213 W.

- **Measurements on high-voltage side with low-voltage winding shorted.**
  Voltage: 60 V. Current: 20.8 A. Power: 750 W.

(a) Neglecting the series impedance, determine the exciting admittance referred to the high-voltage side.
(b) Neglecting the exciting admittance, determine the equivalent series impedance referred to the high-voltage side.
(c) Assuming equal series impedances for the primary and referred secondary, obtain an equivalent T-circuit referred to the high-voltage side.

Problem 4. A single-phase 50-kVA, 2400/240-volt, 60-Hz distribution transformer is used as a step-down transformer at the load end of a 2400-volt feeder whose series impedance is \((1.0 + j2.0) \ \Omega\). The equivalent series impedance of the transformer is \((1.0 + j2.5) \ \Omega\) referred to the high-voltage (primary) side. The transformer is delivering rated load at 0.8 power factor lagging and at rated secondary voltage. Neglecting the transformer exciting current, determine:
(a) The voltage at the transformer primary terminals.
(b) The voltage at the sending end of the feeder.
(c) The real and reactive power delivered to the sending end of the feeder.