Massachusetts Institute of Technology

Department of Electrical Engineering and Computer Science

6.061/6.690 Introduction to Power Systems

Problem Set 6

Issued March 6, 2011
Due March 30, 2011

NOTE:

1. This homework set is due **after** Spring Break.
2. We have a **quiz** on Wednesday, March 16. Calculators and crib sheets are encouraged.Crib sheets are a *single* piece of letter-sized paper, handwritten but you can write on both sides. The quiz venue is the material of Problem Sets 1-5.

Reading: From the text, Chapter 10

Problem 1: From the text, Chapter 7, Problem 8

Problem 2: From the text, Chapter 7, Problem 11

Problem 3: From the text, Chapter 10, Problems 1 and 2

Problem 4: From the text, Chapter 10, Problem 8

Problem 5: From the text, Chapter 10, Problem 16

Problem 6: for 6.690

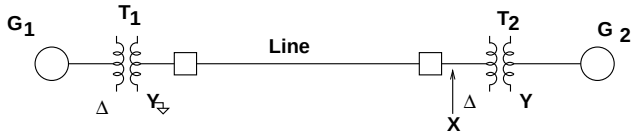

Figure 1: Transmission Line Problem

In this problem, we are concerned about the impact of line unbalance on the generator. The situation is shown in Figure 1; the transmission line is unbalanced. Here is some data on the elements of the system: The transmission line may be modeled as having self-inductance of each phase is 12 mHy and mutual inductance between phases A and B and between phases B and C is 6 mHy. Mutual inductance between phases A and C is 3 mHy. The system is operated at 60 Hz. In this situation, we should treat generator G_2 as a load. If there is real power transfer between G_1 to G_2 of 200 MW, at unity power factor at the terminals of G_2, with per-unit voltage magnitude of unity, can you estimate the value of negative sequence current flowing in the leads of the generator G_1?

Note: You will have to go beyond what we have done in class to find the cross-admittance between positive sequence voltage and negative sequence current in the transmission line

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