

UTA EE5308 PhD Diagnosis Exam (Fall 2011) Power System Modeling

Instructions:

- Verify that your exam contains 7 pages (including the cover sheet).
- Some space is provided for you to show your work. Only if more space is needed, you may show your work on the back of the exam sheet.
- The point values listed on this exam serve only as a guideline. The Department reserves the right to make modifications to the weighting of the problems.
- You may use a calculator.

I Choose to work on Problems _____ and _____ (Choose only 2 from the 3 problems).

Problem	Possible Points	Scores
1	50	
2	50	
3	50	
Total Score (Choose 2 Problems)	100	

Problem 1. Consider the following data about the power system shown below.

- A) Compute per unit phase currents seen on the low voltage and high voltage sides of the transformer below with those seen by at the fault location for single line to ground fault the left side feeder.
- B) Compute phase voltages at the fault point

Network Data:

Nominal Voltage: 13.8 kV

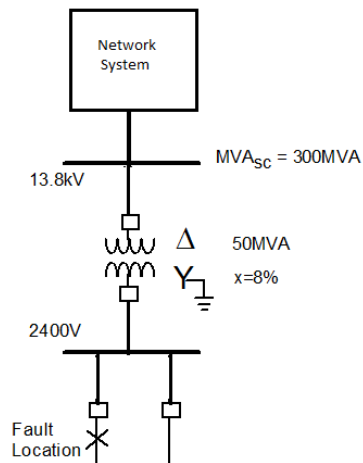
Short circuit capacity: 300 MVA

Transformer Data:

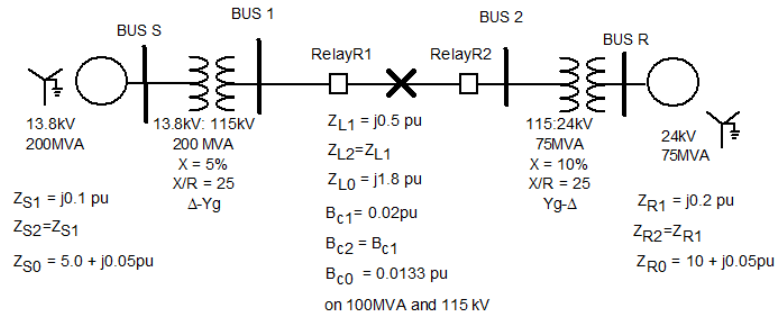
Δ - Y 13.8 kV/ 2400 V

50 MVA

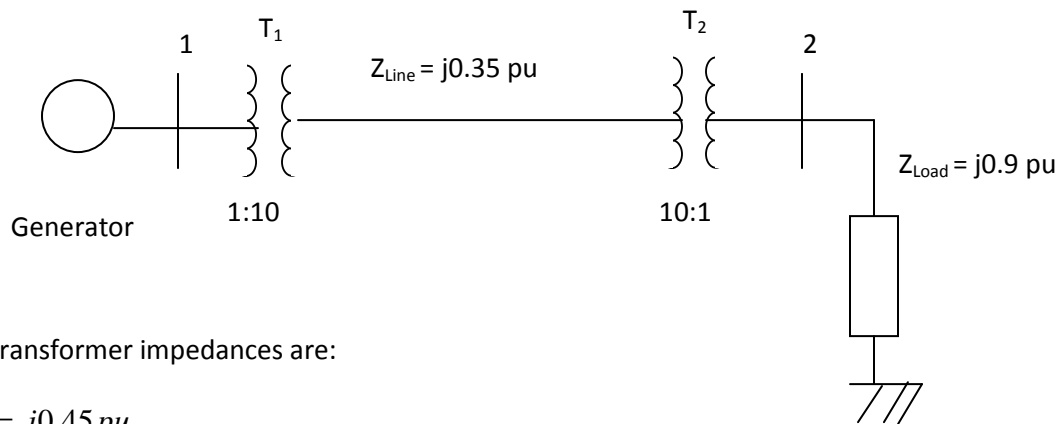
X = 8%



Problem 2. For the following balanced three phase system construct Y_{BUS} for the flow analysis.



Problem 3. The following power system is described in per unit at the same bases. There are two transformers T1 and T2. It is known that their turns ratios are 1:10 and 10:1, respectively.



The transformer impedances are:

$$Z_{T_1} = j0.45 \text{ pu}$$

$$Z_{T_2} = j0.34 \text{ pu}$$

- A). suppose the generator bus voltage is 1 per unit. What is the load bus voltage in per unit?
- B). Now suppose the T2 turns ratio becomes off-nominal. The T2 turns ratio is changed from 10:1 to 8:1.
- (i). What is the off-nominal ratio a ?
 - (ii). Use an equivalent circuit to calculate the new voltage at the load bus. (Hint: Use the Π -circuit model for the off-nominal transformer.)

