

Assignment #9:

Assigned: Lecture 30
 Due: Lecture 33
 Data file: Assign9.txt

As was demonstrated in class, the accuracy for determining relay reach is adversely affected by fault resistance and power flow. Various compensation techniques were discussed in class. Some were demonstrated with relative success, others were not. In this assignment, you will be provided with a data set that includes the fault current. You will also be given the fault location and fault resistance. Using the approximation methods for the fault current in the fault resistance listed below, determine the accuracy of each algorithm. Use the I_{fa} as the reference for the basis of comparison. Please submit the program(s) that you used to complete the entries in the table below.

If	Reach	R_F	Reach error - %	R_F error - %
I_{fa}			0	0
I_a				
$3/2(I_0+I_2)$				
$3/2(I_0+I_2)*CDF_2$				
$3I_2$				
$3I_2*CDF_2$				
I_2*e^{jT}				
$I_2*e^{jT}*CDF_2$				

Simulation data

Fault distance: 50%
 Fault type: Phase A to ground
 Fault resistance: 2.5 ohm
 Primary voltage: 230KV rms phase to phase
 PT ratio: 120/230,000
 CT ratio: 5/3000
 Data sequence: [Va Ia Vb Ib Vc Ic Ifa Ifb Ifc]
 Impedance in Primary ohms

$$Z_s = \begin{pmatrix} 2.402 + 5.685i & 1.257 + 2.89i & 1.198 + 2.718i \\ 1.257 + 2.89i & 2.45 + 5.655i & 1.221 + 2.897i \\ 1.198 + 2.718i & 1.257 + 2.89i & 2.402 + 5.685i \end{pmatrix}$$

$$Z_r = \begin{pmatrix} 0.313 + 6.163i & 0.192 + 3.146i & 0.196 + 2.964i \\ 0.192 + 3.146i & 0.368 + 6.152i & 0.157 + 3.14i \\ 0.196 + 2.964i & 0.192 + 3.146i & 0.313 + 6.163i \end{pmatrix}$$

$$Z_L = \begin{pmatrix} 8.808 + 38.432i & 4.7 + 19.58i & 4.52 + 18.432i \\ 4.7 + 19.58i & 9.14 + 38.3i & 4.47 + 19.58i \\ 4.52 + 18.432i & 4.7 + 19.58i & 8.808 + 38.432i \end{pmatrix}$$

(BTW, since you are given the fault resistance and the fault current, you can also determine current from the remote terminal.)

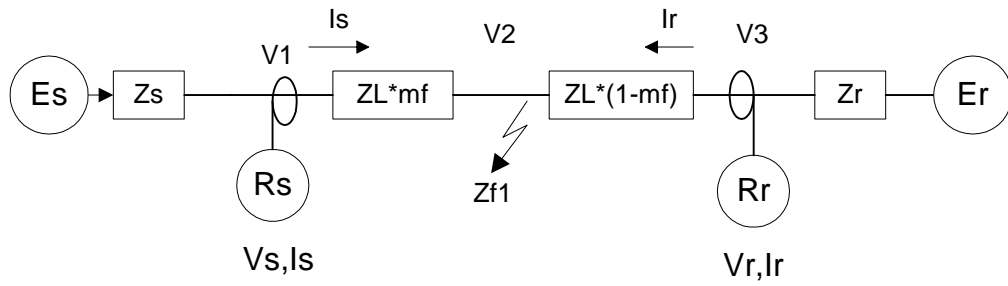


Figure 1. System single line diagram