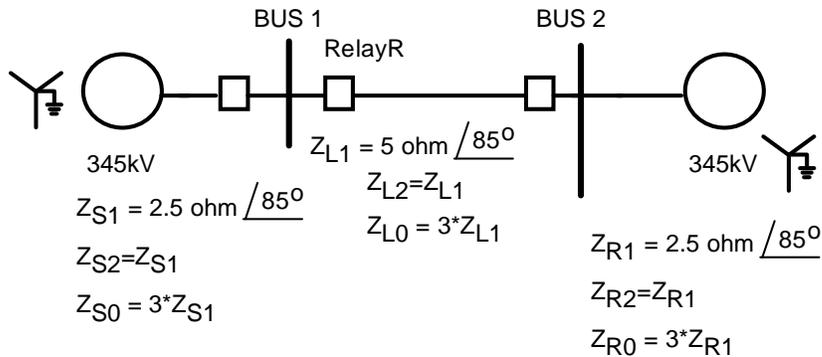


ECE 526: Homework #1

Due Session 6 (January 31)

1. A distance relay is installed at Bus1 as indicated to protect the line from Bus1 to Bus 2. Set zone 1 to protect 80% of the length of the line and zone 2 to protect 125% of the length of the line. The impedance values are in secondary ohms.



$$\text{CTR} = \frac{800\text{A}}{5\text{A}} \quad \text{PTR} = \frac{345\text{kV}}{120\text{V}}$$

- A. For an unfaulted condition, how much load current can flow (unity power factor as measured at the relay) from BUS 1 to BUS 2 without the zone 2 element picking up if the distance relay is a simple impedance relay? What if the power factor is 0.8 lagging? Assume BUS 1 has a voltage of 1.0 pu. Does it matter if power is going from BUS 1 to BUS 2 or from BUS2 to BUS 1?
- B. Repeat if a mho relay is used instead.
- C. With the breaker at bus open calculate what the following mho elements will calculate for a SLG (AG) fault at 70% of the way down the line (AG, BG, CG, AB, BC, CA) if the fault resistance is zero. Plot your results against a mho circle. You can use a fault program to calculate the voltages and currents seen by the relay if you wish to do so). Repeat with $R_f = 1$ ohm and with $R_f = 4$ ohms. Repeat calculations for 3 phase, LL (BC) and DLG (BCG) faults. Do not do the fault resistance cases for the DLG fault.
- D. Repeat part C if the circuit breaker is closed.