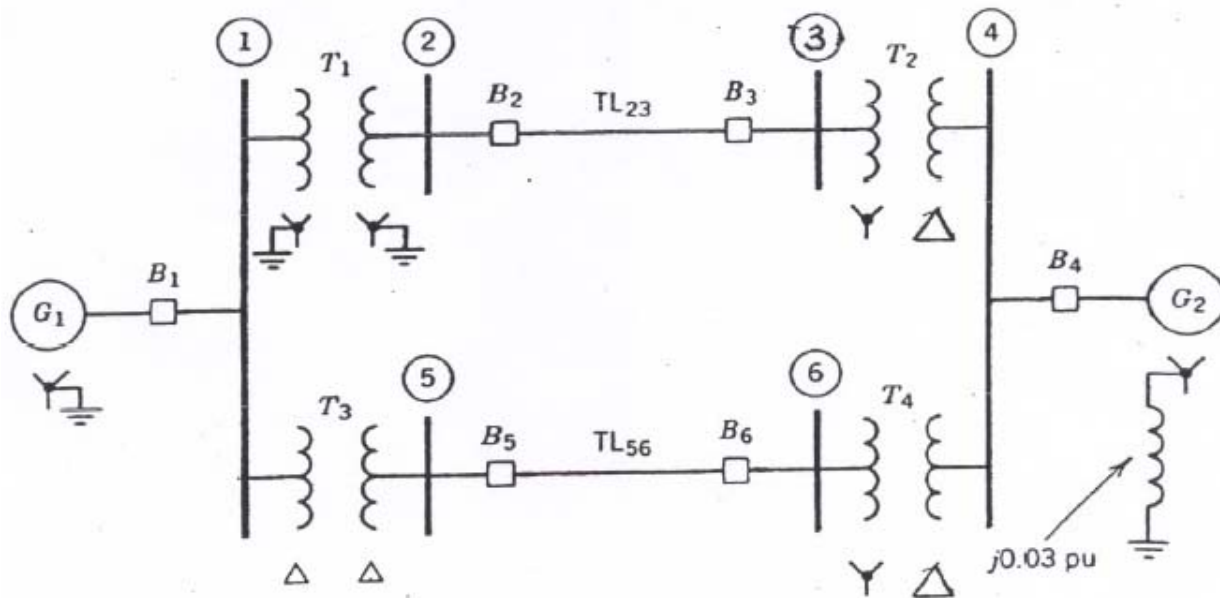


ECE470 POWER SYSTEMS I

Homework Set 8

1. a) The currents feeding a Y-connected unbalanced load are:
- $$I_A = 50/\underline{36.9} \text{ A}$$
- $$I_B = 30/\underline{-90} \text{ A}$$
- $$I_C = 40/\underline{180} \text{ A}$$
- i) Determine the sequence components, I_{a1}, I_{a2} , and I_{a0} .
- ii) Is the load grounded or ungrounded?
- b) The phase voltages of a delta-connected unbalanced load are:
- $$V_{AB} = 250/\underline{0} \text{ V}$$
- $$V_{BC} = 150/\underline{-126.9} \text{ V}$$
- $$V_{CA} = 200/\underline{143.1} \text{ V}$$
- Determine the sequence components, V_{a1}, V_{a2} , and V_{a0} .
- c) The sequence components of currents feeding an unbalanced load are:
- $$I_{a0} = 10/\underline{45} \text{ A}$$
- $$I_{a1} = 50/\underline{0} \text{ A}$$
- $$I_{a2} = 20/\underline{-60} \text{ A}$$
- iii) Determine the phase currents, I_A, I_B , and I_C .
- iv) What is the load configuration?

2. Draw the positive, negative and zero sequence reactance diagrams, for the system shown below, using a 200 MVA, 230 kV base in the zone of line 2 - 3.
3. If all excitation voltages are 1 pu, determine the Thevenin Equivalents for the positive, negative and zero sequence networks, for faults at bus 3.
4. Calculate the phase voltages and phase currents at bus 3 for the following faults:
 - i) 1 ϕ -G ii) 3 ϕ -G iii) 2 ϕ iv) 2 ϕ -G



| Network Component | MVA Rating | Voltage Rating (kV) | X_1 (pu) | X_2 (pu) | X_0 (pu) |
|-------------------|------------|---------------------|------------|------------|------------|
| G_1 | 200 | 20 | 0.2 | 0.14 | 0.06 |
| G_2 | 200 | 13.2 | 0.2 | 0.14 | 0.06 |
| T_1 | 200 | 20/230 | 0.2 | 0.2 | 0.2 |
| T_2 | 200 | 13.2/230 | 0.3 | 0.3 | 0.3 |
| T_3 | 200 | 20/230 | 0.25 | 0.25 | 0.25 |
| T_4 | 200 | 13.2/230 | 0.35 | 0.35 | 0.35 |
| TL_{23} | 200 | 230 | 0.15 | 0.15 | 0.3 |
| TL_{56} | 200 | 230 | 0.22 | 0.22 | 0.5 |