

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:

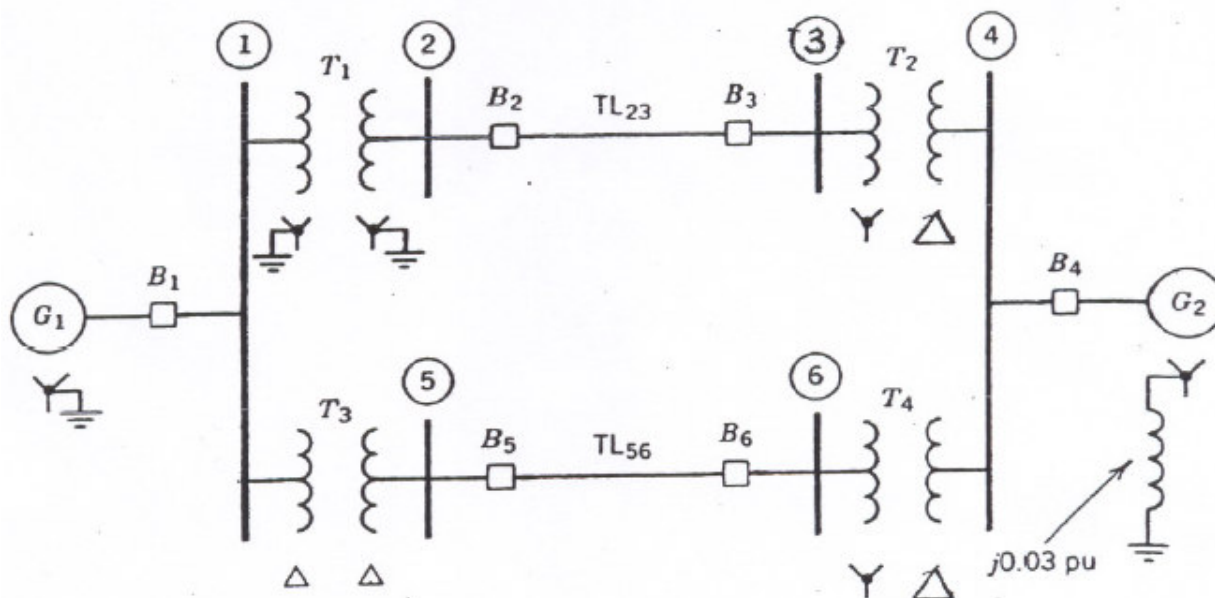
$$I_{a0} = 10/\underline{45} \text{ A}$$

$$I_{a1} = 50/\underline{0} \text{ A}$$

$$I_{a2} = 20/\underline{-60} \text{ A}$$

- 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