## Problem Set - 6
Fault Analysis

1. A generator is connected through a transformer to a synchronous motor. The per unit subtransient reactances of the generator and motor are 0.15 and 0.35 respectively and the leakage reactnace of the transformer is 0.10 per unit. A three phase fault occurs at the terminals of the motor when the terminal voltage of the generator is 0.9 per unit and the output current of the generator is 1 per unit and 0.8 power factor leading. Find the subtranisent current in the fault in per unit.(**Ans:** $I''_f = -0.55 - j6.58$)

2. For the network shown here, find the subtransient current in per unit from generator 1 and the voltages at buses 1 and 3 for a three phase fault on bus 2. Assume that no current is flowing prior to the fault and the prefault voltage at bus 2 is $1.0\angle 0°$ per unit. (**Ans:** $I''_{g1} = 2.43\angle -90°$, $V_1 = 0.515$ and $V_3 = 0.592$)
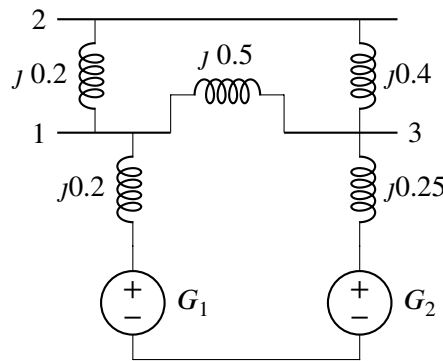
3. The currents flowing in the lines toward a balanced load connected in Δ are $I_a = 100\angle 0°$, $I_b = 141.4\angle 225°$ and $I_c = 100\angle 90°$. Find the symmetrical components of the given line currents. What is I_{ab} in A ? (**Ans:** $I_{ab} = 74.5\angle 26.6°$ A)

4. A Y- connected synchronous generator has sequence reactances $X_) = 0.09$, $X_1 = 0.22$ and $X_2 = 0.36$, all in per unit. The neutral point of the machine is grounded through a reactance of 0.09 per unit. The machine is running on no load with rated terminal voltage when it suffers an unbalanced fault. Determine the fault currents in per unit if a double line to ground fault occurs at its terminals. (**Ans:** $I_a = 0$, $I_b = 3.75\angle 150°$ and $I_c = 3.75\angle 30°$)

5. The reactance data for the power system shown here in per unit on a common base is as follows:
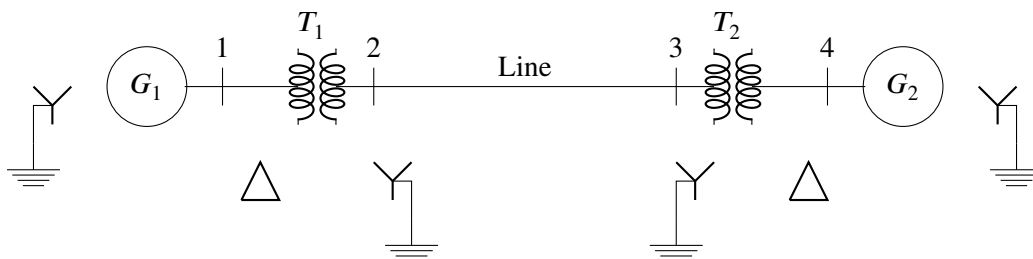
Item	X_1	X_2	X_0
G_1	0.10	0.10	0.05
G_2	0.10	0.10	0.05
T_1	0.25	0.25	0.25
T_2	0.25	0.25	0.25
Line	0.30	0.30	0.50

Compute the fault current in per unit if a bolted single line to ground fault occurs at bus 2. (**Ans:** $4.669\angle -90°$)