1- A single Phase transformer is rated 110/440 V, 2.5 kVA. The leakage reactance measured from low voltage side is 0.05 ohm. Determine the following:

a) The leakage reactance in per unit measured from low voltage side.
b) The leakage reactance measured from high voltage side.
c) The leakage reactance in per unit measured from high voltage side.
d) Comment on your answers on previous items.

2- Three parts of single Phase electric system are designated A, B, and C and are connected to each other through transformers as shown in figure 1. The transformers are rated as follows:

A-B 10,000 kVA, 13.8/138 kV, leakage reactance 10%

B-C 10,000 kVA, 138/69 kV, leakage reactance 18%

If the base in circuit B is chosen as 10,000 kVA, 138 kV, then

a) Find the per unit impedance of the 300 ohm resistive load in circuit C referred to circuits A, B, and C. Comment on your results.
b) Draw the impedance diagram neglecting the magnetizing current, transformer resistance, and line impedance.
c) Determine the voltage regulation if the voltage at the load is 66 kV.

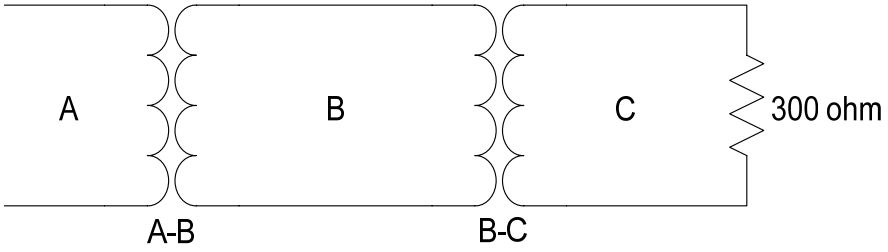

Figure 1.

3- Draw an impedance diagram for the electric power system shown in Figure 2 showing all impedances in per unit on a 100-MVA base. Choose 20 kV as the voltage base for generator. The three-phase power and line-line ratings are given below.

*G*1 : 90 MVA 20 kV X = 9%, *T*1 : 80 MVA 20/200 kV X = 16%
*G*2 : 90 MVA 18 kV X = 9%, *T*2 : 80 MVA 200/20 kV X = 20%
Line: 200 kV X = 120 ohm, Load: 200 kV S = 48 MW +*j*64 Mvar

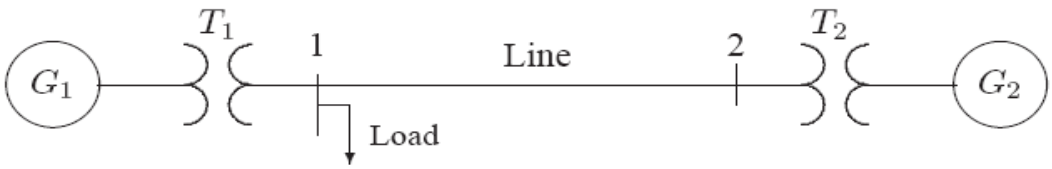

Figure 2.

4- The one-line diagram of a power system is shown in Figure 3 the three-phase power and line-line ratings are given below. Draw an impedance diagram showing all Impedances in per unit on a 100-MVA base. Choose 22 kV as the voltage base for generator.

G: 80 MVA 22 kV X = 24%
*T*1: 50 MVA 22/220 kV X = 10%
*T*2: 40 MVA 220/22 kV X = 6:0%
*T*3: 40 MVA 22/110 kV X = 6:4%
*T*4: 40 MVA 110/22 kV X = 5:4%
Line 1: 220 kV X = 121 Ω
Line 2: 110 kV X = 42:35 Ω
M: 60 MVA 20 kV X = 22:5%

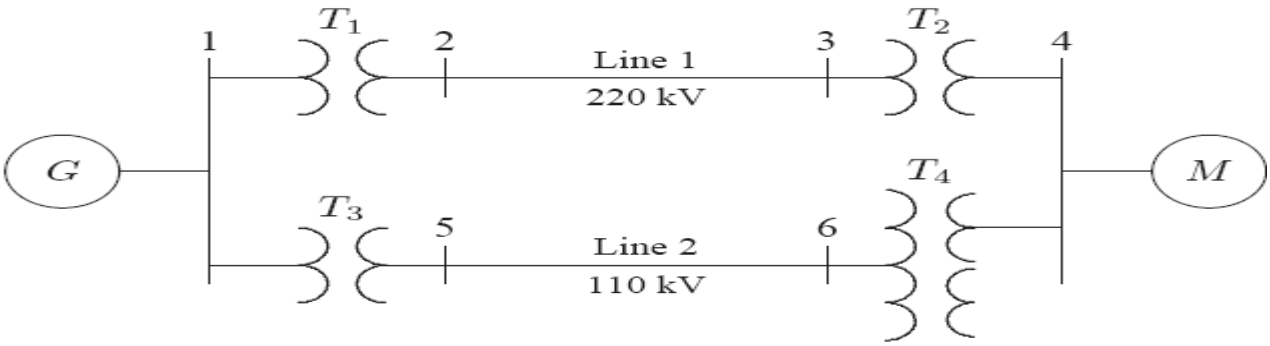

Figure 3.

5- A 30,000-kVA 13.8-kV three-phase generator has a subtransient reactance of 15%. The generator supplies two motors over a transmission line having transformers at both ends, as shown on the one-line diagram of Fig. 6.9. The motors have rated inputs of 20,000 and 10,000 kVA, both 12.5 kV with $X'' = 20\%$. The three-phase transformer T_1 is rated 35,000 kVA, 13.2Δ–115Y kV with leakage reactance of 10%. Transformer T_2 is composed of three single-phase transformers each rated 10,000 kVA, 12.5–67 kV with leakage reactance of 10%. Series reactance of the transmission line is 80 Ω. Draw the reactance diagram with all reactances marked in per unit. Select the generator rating as base in the generator circuit.

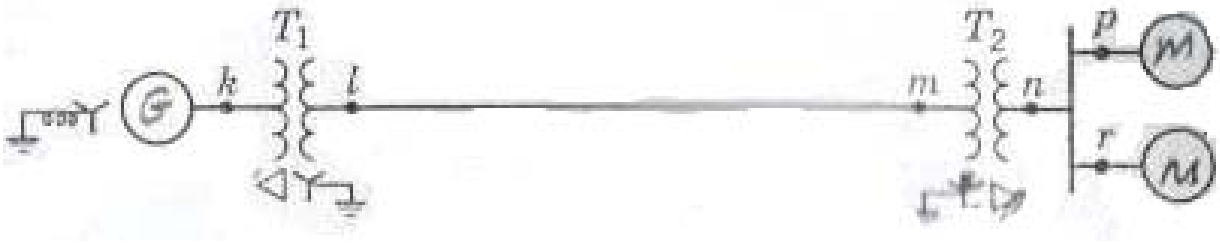

Figure 4.

6- If the motors of problem 5 have inputs of 16,000 and 8,000 kW, respectively at 12.5 kV and both operate at unity power factor. Find the voltage at terminals of the generator.