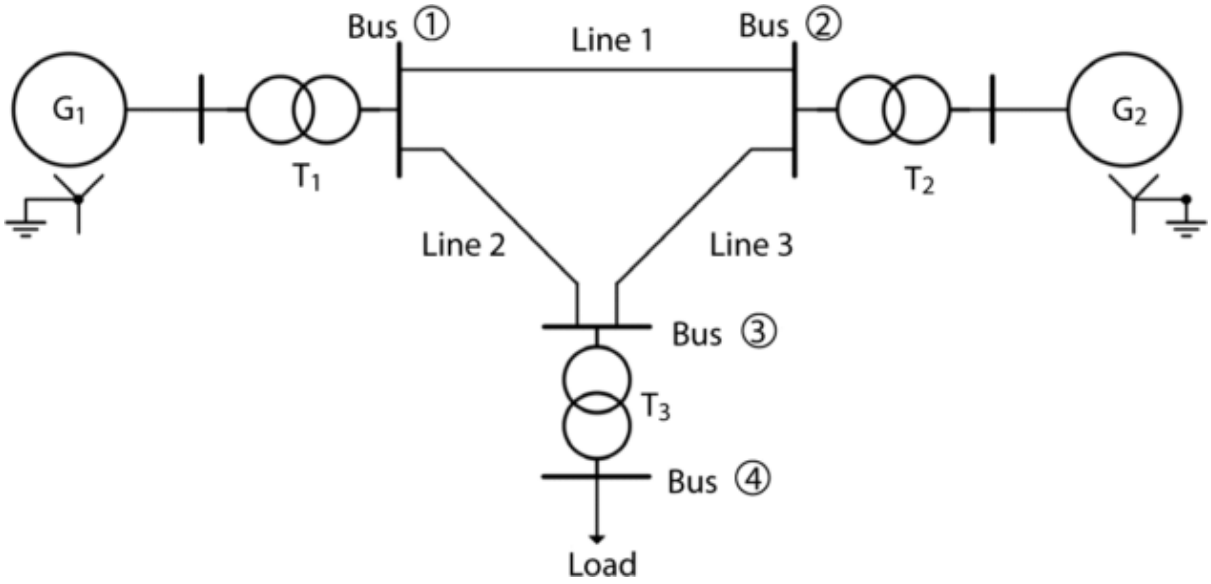
TUTORIAL-1

1. The single-line diagram of a three-phase system is shown in Fig. 1. Using the common base S_b = 50 MVA, draw the impedance diagram in per unit including the load impedance. The three-phase load at bus 4 absorbs 60 MVA at 0.75 power factor (lagging), and lines 1, 2, and 3 have the reactance of 40Ω, 32 Ω, and 30Ω, respectively.

A. Find out the Per-unit reactance of the generators and transformers.
B. Find out the impedance buses for lines 1, 2, and 3.
C. Find out the per-unit reactance of lines 1, 2, and 3.
D. Find out the per-unit load impedance for bus 4.



Device	S_n	$U_{(L\text{-}L)n}$	X_n
Generator G_1:	48 MVA	20 kV	20%
Generator G_2:	25 MVA	13.8 kV	15%
Transformer T1:	50 MVA	20/110 kV	8%
Transformer T2:	30 MVA	13.8/110 kV	6%
Transformer T3:	50 MVA	11/110 kV	10%

2. Consider a load that is connected to a transmission line defined by the following parameters:

A. The lightning load of 20 KW at unity power factor,

B. Induction motor load 100 KW at power factor 0.707 lagging,

C. Synchronous motor load of 50 KW at power factor 0.9 leading.

Calculate the total KW and KVA delivered by the generator and power factor at which it works.