Smart Grid Systems

Laboratory Work #1

Modelling of Simple Power System in SimPowerSystems

The main aim of this laboratory work #1 is to develop model of a simple power system using SimPowerSystems toolbox and perform load flow studies of the system. The following 4 bus power system is considered as the test power system where base power and voltage is considered to be 100MVA and 15kV respectively. It is required to maintain 1pu voltage at every bus of the power system which is commonly known as flat voltage profile.

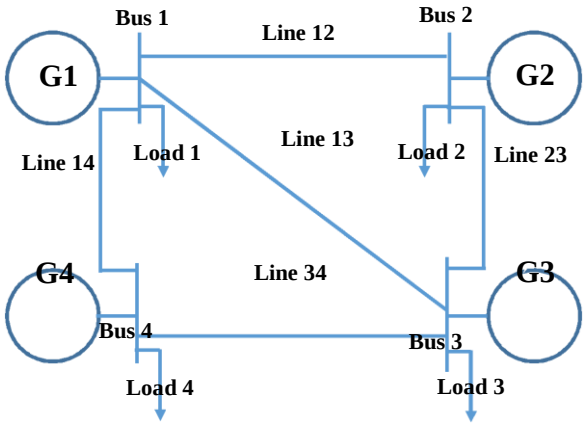

Figure 1: Four Bus Power System

Table 1: Bus Power Data

Bus #	Real Power Demand (pu)	Reactive Power Demand (pu)	Real Power Generation (pu)	Reactive Power Generation (pu)
1 2	1 0	0.5 0.4	? 4	? ?
3	2	1	0	?
4	2	1	0	?

The transmission network of the power system is loss less. Data related to the transmission network is provided below.

Table 2: Transmission Network Data

Transmission Line	Reactance (pu)
Line 12	**0.15**
Line 13	**0.2**
Line 14	**0.1**
Line 23	**0.1**
Line 34	**0.15**

Following tasks the students are required to be performed by the students:

1. Identify bus type of each of the buses from the data provide in Table 1.
2. Covert bus power data in SI units using system base.
3. Convert transmission line impedance data in SI units.
4. Calculate resistance and inductance of each of the transmission line in SI unit and tabulate them.
5. Construct a SimPowerSystem model of the system under consideration.
6. Perform load flow analysis.
7. Generate a load flow report of the system.
8. Analyse the load flow result of the system which should include (i) discussion on the power balance of the system, (ii) discussion on the power flow throughout the network, and (iii) voltage magnitude and angle at the buses.

Students are required to submit a report on this laboratory work. On campus students required to individually show their developed SimPowerSystem model during the laboratory works. Cloud students are required to send their model via email to the lecturer and discuss their results during the Blackboard session.