

Mini Project

The 6-bus power system network of an electric utility company is shown in Fig 1 below. The line and transformer data containing the series resistance and reactance in per unit, and one-half of the total capacitance in per unit susceptance on a 100-MVA base, is given in Table 1. The transient impedance of the generators on a 100-MVA base is given in Table 2. Voltage magnitude, generation schedule, and the reactive power limits for the regulated buses are given in Table 3. The load data is given in Table 4. Bus 1, whose voltage is specified as $V_1 = 1.06\angle 0^\circ \text{ pu}$, is taken as the slack bus.

(1) Perform *load-flow analysis* and

- Compute voltage magnitude and angle of each bus
- Compute total power loss
- Construct line-flow diagram

Considering the pre-fault bus voltages and the effect of load currents,

(2) Perform *symmetrical three-phase short circuit analysis* to compute

- the fault current,
- bus voltages,
- line currents, and
- short-circuit-capacity (SCC) for a bolted three-phase fault at bus 6.

(3) Repeat step (1) for faults at buses 4, and 5.

(4) Compare the SCC's at 4, 5, and 6.

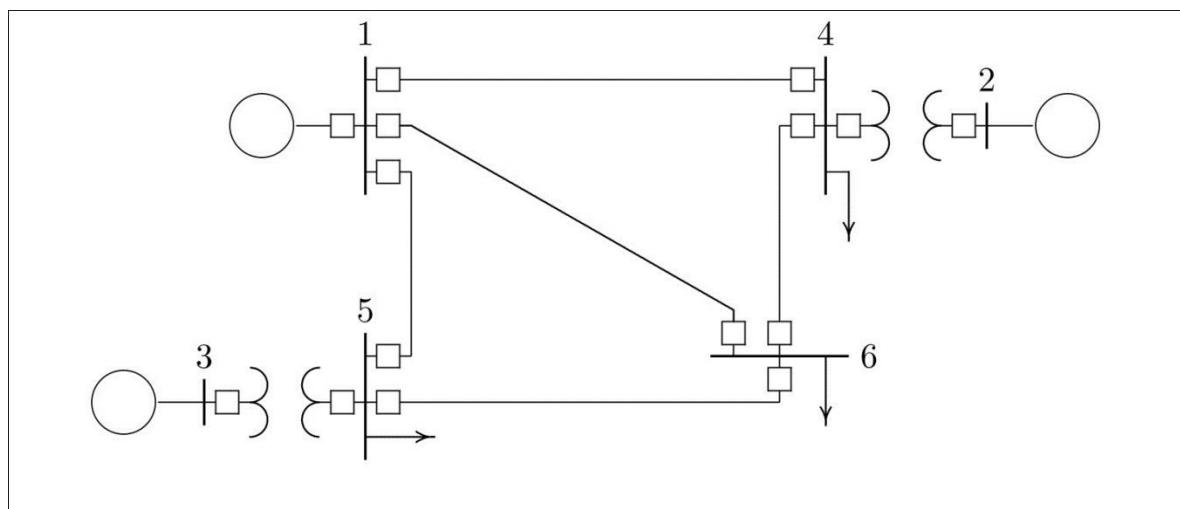


Fig 1: One-line diagram for the mini project

- (5) Write a formal report containing (i) necessary data file created (ii) MatLab Programs selected, and (ii) results in tabular forms.
 - (6) Have a thorough understanding of the programs used and results generated. Prepare for a comprehensive oral test on this project.
 - (7) Quality of report and viva performance are important elements for the grading. Bring your laptop computer containing MatLab programs to demonstrate your works.

Table 1

LINE AND TRANSFORMER DATA				
Bus No.	Bus No.	R, PU	X, PU	$\frac{1}{2} B$, PU
1	4	0.035	0.225	0.0065
1	5	0.025	0.105	0.0045
1	6	0.040	0.215	0.0055
2	4	0.000	0.035	0.0000
3	5	0.000	0.042	0.0000
4	6	0.028	0.125	0.0035
5	6	0.026	0.175	0.0300

Table 2

GEN. TRANSIENT IMPEDANCE, PU		
Gen. No.	R_a	X'_d
1	0	0.20
2	0	0.15
3	0	0.25

Table 4

GENERATION DATA				
Bus No.	Voltage Mag.	Generation, MW	Mvar Min.	Limits Max.
1	1.060			
2	1.040	150.0	0.0	140.0
3	1.030	100.0	0.0	90.0

Table 3

LOAD DATA		
Bus No.	MW	Mvar
1	0	0
2	0	0
3	0	0
4	100	70
5	90	30
6	160	110

Grading: (i) Report 5 (ii) Presentation 5

Hint:

- (a) Use anyone of the power flow programs to obtain the pre-fault bus voltages and the load admittance. The power flow program returns the pre-fault bus voltage array **V** and the bus load admittance array **yload**.
 - (b) Study the examples in your Textbook and choose the right programs available.