



Ahsanullah University of Science & Technology

Department of Electrical and Electronic Engineering

Software Project

Course No : EEE-4154

Course Name : Power System-II Laboratory

Project Name : Load Flow Studies Using Power World Simulator

Date of Submission : 01.08.2023

Submitted by

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Year : 4th

Semester : 1st

Section : C2

Objective:

This project aims to analyze the power flow in a given power system using the Power World Simulator and observe the load flow and fault info.

Calculation:

System Base Quantities:

$$S_{\text{base}} = 84 \text{ MVA [Last two digit of Student Id]}$$

$$V_{\text{base}} = \sqrt{84} = 9.16 \text{ kV in the zone of G1}$$

Generator Ratings:

G1: 100 MVA, 13.8 kV, $x = 0.12 \text{ pu}$

$$X'_{G1} = 0.12 \times \left(\frac{13.8}{9.16}\right)^2 \times \frac{84}{100} = 0.23 \text{ pu}$$

G2: 200 MVA, 15 kV, $x = 0.12 \text{ pu}$

$$X'_{G2} = 0.12 \times \left(\frac{15}{9.96}\right)^2 \times \frac{84}{200} = 0.114 \text{ pu}$$

Transformer Ratings:

T1: 100 MVA, 13.8 kV Δ / 230 kV Y, $X = 0.1 \text{ pu}$

$$X'_{T1} = 0.1 \times \left(\frac{13.8}{9.16}\right)^2 \times \frac{84}{100} = 0.1 \text{ pu}$$

T2: 200 MVA, 15 kV Δ / 230 kV Y, $X = 0.1 \text{ pu}$

$$X'_{T2} = 0.1 \times \left(\frac{230}{152.6}\right)^2 \times \frac{84}{200} = 0.095 \text{ pu} = 0.1 \text{ pu}$$

Transmission Lines:

All lines 230 kV, $z = 0.08 + j 0.5 \Omega/\text{km}$, $y = j 3.4 \times 10^{-6} \text{ S/km}$

Maximum MVA = 400

MVA Line lengths: L1 = 15 km, L2 = 25 km, L3 = 40 km, L4 = 15 km, L5 = 50 km

$$\text{Base Impedance} = \frac{(230 \times 10^3)^2}{84 \times 10^6} = 629.76 \, \Omega$$

$$X'_{L1} = (0.08 + j0.5) \times \frac{15}{629.76} = 0.00190 + 0.0119j \, \text{pu}$$

$$X'_{L2} = (0.08 + j0.5) \times \frac{25}{629.76} = 0.00317 + 0.0198j \, \text{pu}$$

$$X'_{L3} = (0.08 + j0.5) \times \frac{40}{629.76} = 0.00508 + 0.0317j \, \text{pu}$$

$$X'_{L4} = (0.08 + j0.5) \times \frac{15}{629.76} = 0.00190 + 0.0119j \, \text{pu}$$

$$X'_{L5} = (0.08 + j0.5) \times \frac{50}{629.76} = 0.00635 + 0.0396j \, \text{pu}$$

$$\text{Base Admittance} = \frac{84 \times 10^6}{(230 \times 10^3)^2} = 1.58 \times 10^{-3} \, \text{S}$$

$$Y'_{L1} = j 3.4 \times 10^{-6} \times \frac{15}{1.58 \times 10^{-3}} = 0.0322j \, \text{pu}$$

$$Y'_{L2} = j 3.4 \times 10^{-6} \times \frac{25}{1.58 \times 10^{-3}} = 0.0537j \, \text{pu}$$

$$Y'_{L3} = j 3.4 \times 10^{-6} \times \frac{40}{1.58 \times 10^{-3}} = 0.0860j \, \text{pu}$$

$$Y'_{L4} = j 3.4 \times 10^{-6} \times \frac{15}{1.58 \times 10^{-3}} = 0.0322j \, \text{pu}$$

$$Y'_{L5} = j 3.4 \times 10^{-6} \times \frac{50}{1.58 \times 10^{-3}} = 0.1075j \, \text{pu}$$

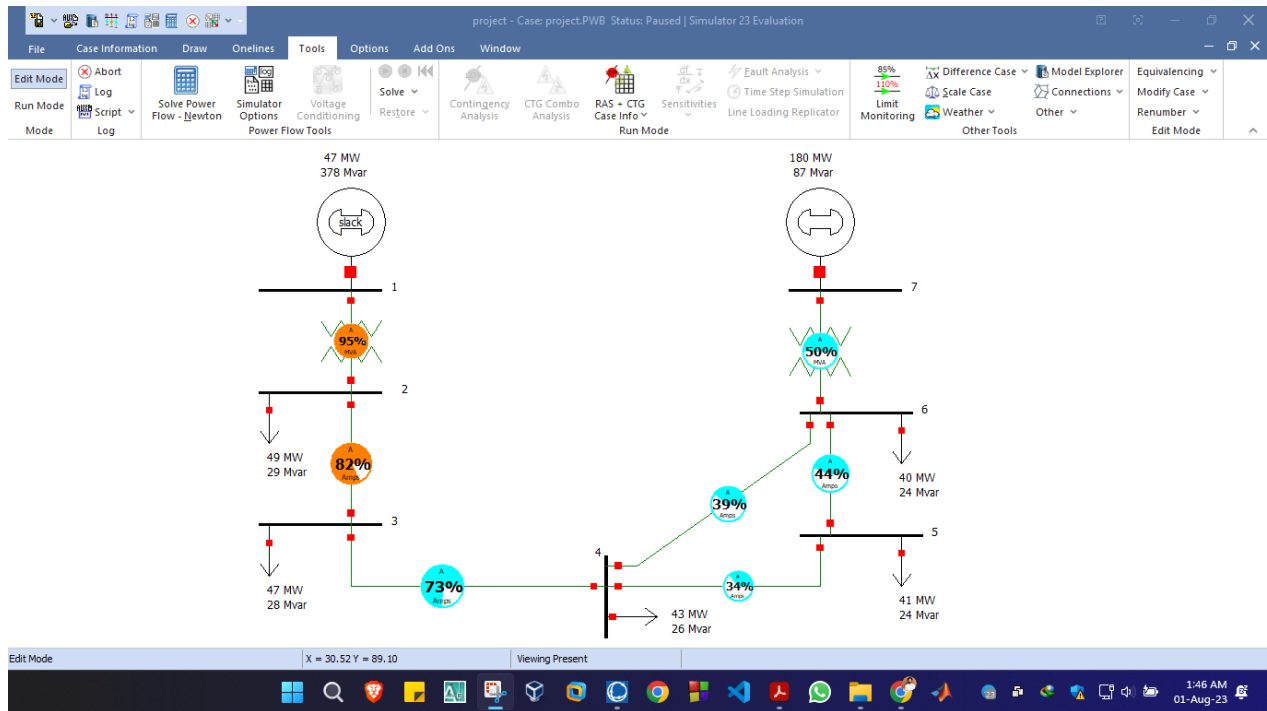
Power Flow Data:

Bus 1: Swing bus, V1 = 13.8 kV, $\delta_1 = 0$ deg.

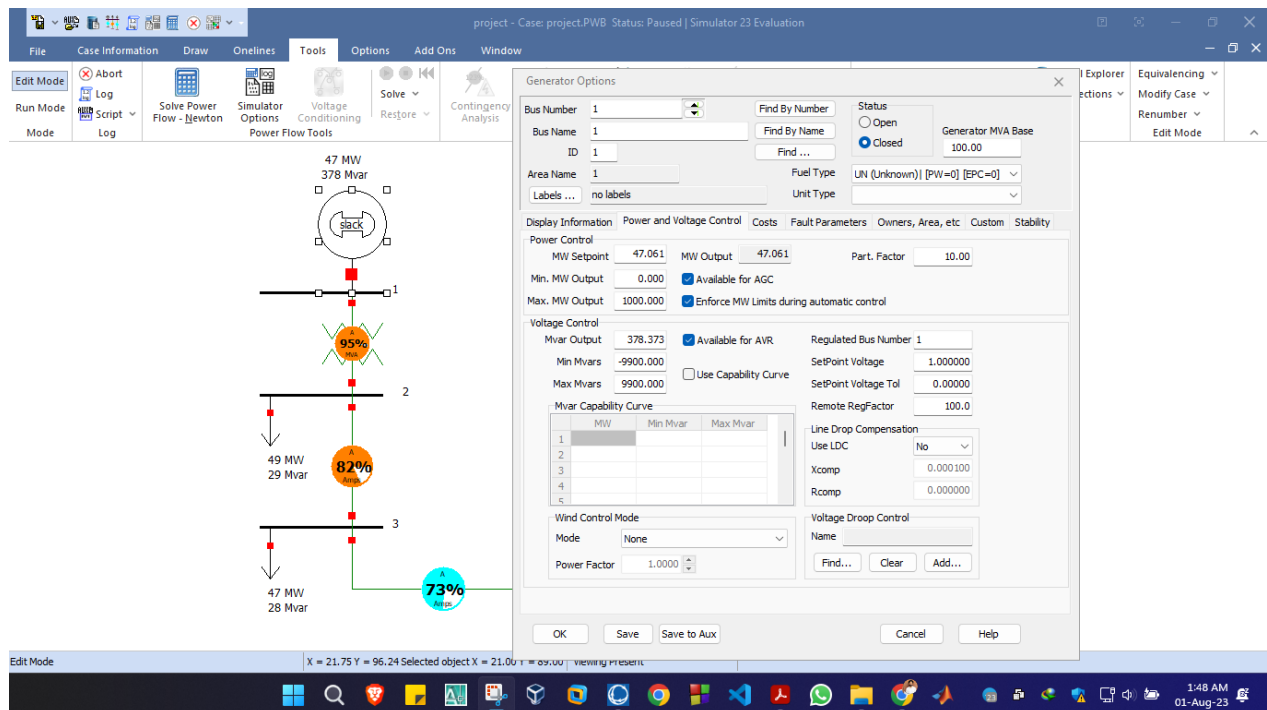
Bus 2, 3, 4, 5, 6: Load buses.

Bus 7: Generator bus, $|V_7| = 5$ kV, PG7 = 180 MW, $-87 \text{ Mvar} < QG7 < +87 \text{ Mvar}$

System Design:



Generator 1:



Generator 2:

The screenshot shows the 'Generator Options' dialog box for Generator 2. The dialog is divided into several sections:

- General Information:** Bus Number 7, Bus Name 7, ID 1, Area Name 1, Labels... no labels. Status is set to 'Closed'. Fuel Type is 'UN (Unknown)' and Unit Type is 'EPC=0'. Generator MVA Base is 200.00.
- Power and Voltage Control:** MW Setpoint 180.000, MW Output 180.000, Part. Factor 10.00. Min. MW Output 0.000, Max. MW Output 1000.000. ☐ Available for AGC. ☒ Enforce MW Limits during automatic control.
- Voltage Control:** Mvar Output 87.000, Min Mvars -87.000, Max Mvars 87.000. ☐ Available for AVR. ☐ Use Capability Curve. Regulated Bus Number 7. SetPoint Voltage 0.995000, SetPoint Voltage Tol 0.00000. Remote RegFactor 100.0.
- Mvar Capability Curve:** A table with columns MW, Min Mvar, and Max Mvar. The table is currently empty.
- Line Drop Compensation:** Use LDC No, Xcomp 0.000100, Rcomp 0.000000.
- Voltage Droop Control:** Name field with Find..., Clear, and Add... buttons.
- Wind Control Mode:** Mode None, Power Factor 1.0000.

The background shows a power system diagram with buses 5, 6, and 7. Bus 7 is connected to Bus 6, which is connected to Bus 5. Bus 7 has a generator symbol and a 50% load. Bus 6 has a 44% load. Bus 5 has a 41 MW 24 Mvar load. The status bar at the bottom shows 'X = 68.93 Y = 95.42 Selected object X = 67.00 Y = 89.00 | Viewing Present'.

Bus 1:

The screenshot shows the 'Bus Options' dialog box for Bus 1. The dialog is divided into several sections:

- General Information:** Bus Number 1, Bus Name 1, Nominal Voltage 9.1600 kV, Labels... no labels. Area, Balancing Authority, Zone, Owner, Substation, and Data Maintainer are all set to 1.
- Bus Information:** Display, Attached Devices, Geography, Custom, Stability. Bus Voltage 1.0000, Voltage (p.u.) 1.0000, Angle (degrees) 0.000. ☒ System Slack Bus.

The background shows a power system diagram with buses 1, 2, and 3. Bus 1 is connected to Bus 2, which is connected to Bus 3. Bus 1 has a 47 MW 378 Mvar load. Bus 2 has a 49 MW 29 Mvar load. Bus 3 has a 47 MW 28 Mvar load. The status bar at the bottom shows 'X = 13.07 Y = 89.01 Selected object X = 12.00 Y = 89.00 | Viewing Present'.

Bus 2:

The screenshot shows the 'Bus Options' dialog box for Bus 2. The dialog is open over a power system diagram. The diagram shows a network with three buses (1, 2, and 3) connected by lines. Bus 1 is at the top, connected to Bus 2, which is connected to Bus 3. There are also loads connected to each bus: 47 MW / 378 Mvar at Bus 1, 49 MW / 29 Mvar at Bus 2, and 47 MW / 28 Mvar at Bus 3. A 'slack' bus is indicated at Bus 1. The 'Bus Options' dialog for Bus 2 shows the following settings:

- Bus Number: 2
- Bus Name: 2
- Nominal Voltage: 152.6700 kV
- Labels: no labels
- Area: 1
- Balancing Authority: 1
- Zone: 1
- Owner: 1
- Substation: (empty)
- Data Maintainer: (empty)
- Bus Information: Display, Attached Devices, Geography, Custom, Stability
- Bus Voltage: Voltage (p.u.): 0.6234, Angle (degrees): -4.329
- System Slack Bus: ☐

The status bar at the bottom indicates 'X = 15.88 Y = 79.15 Selected object X = 12.00 Y = 79.00 Viewing Present'.

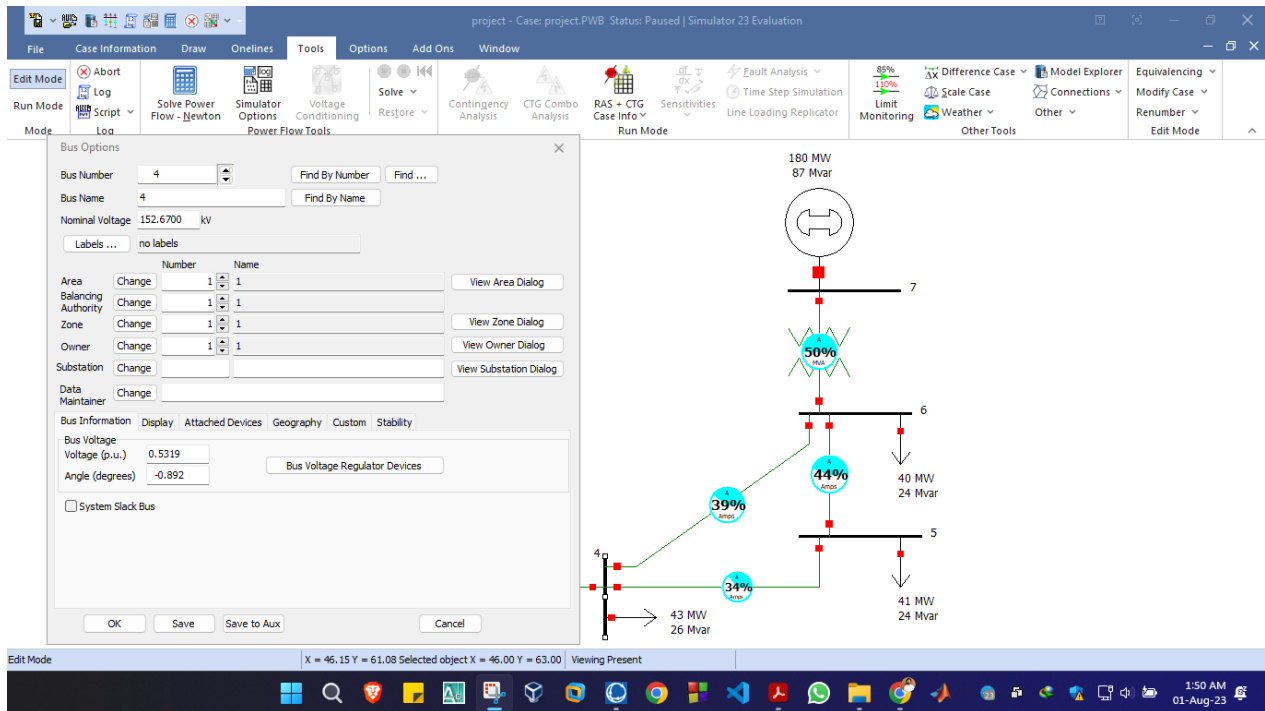
Bus 3:

The screenshot shows the 'Bus Options' dialog box for Bus 3. The dialog is open over the same power system diagram as the previous screenshot. The 'Bus Options' dialog for Bus 3 shows the following settings:

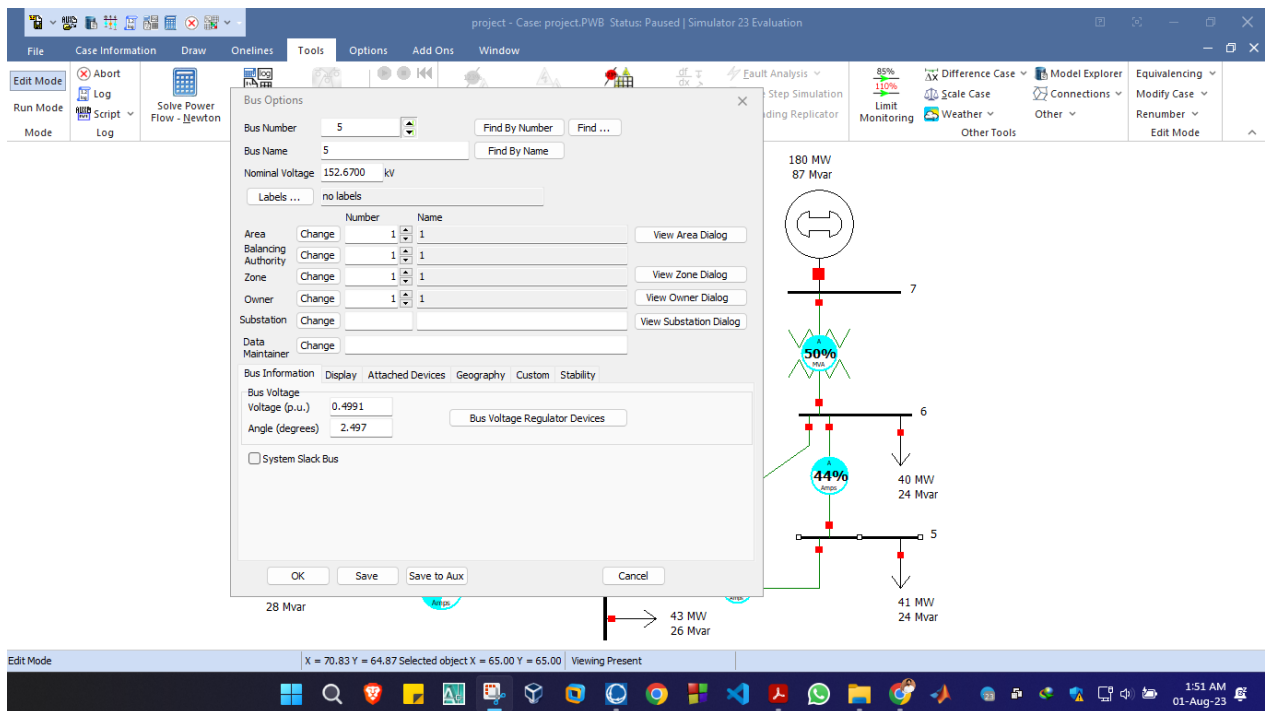
- Bus Number: 3
- Bus Name: 3
- Nominal Voltage: 152.6700 kV
- Labels: no labels
- Area: 1
- Balancing Authority: 1
- Zone: 1
- Owner: 1
- Substation: (empty)
- Data Maintainer: (empty)
- Bus Information: Display, Attached Devices, Geography, Custom, Stability
- Bus Voltage: Voltage (p.u.): 0.5845, Angle (degrees): -3.691
- System Slack Bus: ☐

The status bar at the bottom indicates 'X = 17.14 Y = 65.87 Selected object X = 12.00 Y = 66.00 Viewing Present'.

Bus 4:



Bus 5:



Bus 6:

The screenshot shows the 'Bus Options' dialog box for Bus 6. The dialog is titled 'Bus Options' and contains the following fields and options:

- Bus Number: 6
- Bus Name: 6
- Nominal Voltage: 152.6700 kV
- Labels: no labels
- Area: 1
- Balancing Authority: 1
- Zone: 1
- Owner: 1
- Substation:
- Data Maintainer:
- Bus Information: Display Attached Devices Geography Custom Stability
- Bus Voltage: Voltage (p.u.): 0.4945, Angle (degrees): 4.883
- System Slack Bus: ☐

The background shows a power system diagram with buses 5, 6, and 7. Bus 7 is connected to a 180 MW generator. Bus 6 is connected to a 40 MW load and a 41 MW load. Bus 5 is connected to a 43 MW load. The diagram also shows a 50% fault on the line between buses 6 and 7.

Bus 7:

The screenshot shows the 'Bus Options' dialog box for Bus 7. The dialog is titled 'Bus Options' and contains the following fields and options:

- Bus Number: 7
- Bus Name: 7
- Nominal Voltage: 9.9600 kV
- Labels: no labels
- Area: 1
- Balancing Authority: 1
- Zone: 1
- Owner: 1
- Substation:
- Data Maintainer:
- Bus Information: Display Attached Devices Geography Custom Stability
- Bus Voltage: Voltage (p.u.): 0.5207, Angle (degrees): 49.229
- System Slack Bus: ☐

The background shows the same power system diagram as the previous screenshot. The 50% fault is now on the line between buses 7 and 6. The diagram also shows a 44% fault on the line between buses 6 and 5.

Transformer 1:

project - Case: project.PWB Status: Paused | Simulator 23 Evaluation

File Case Information Draw Onlines Tools Options Add Ons

Edit Mode Log Script Run Mode Mode

47 MW 378 Mvar

95%

82%

49 MW 29 Mvar

47 MW 28 Mvar

73%

Branch Options

Transformer Number 1 From Bus 2 To Bus 1 Circuit 1

Name 1 2

Area Name 1 (1) 1 (1)

Nominal kV 9.960 152.7

Labels ... no labels

Find By Numbers Find By Names Find ...

From End Metered

Default Owner (Same as From Bus)

Display Parameters Transformer Control Fault Info Owner, Area, Zone, Sub Custom Stability Geography

Status ☐ Open ☒ Closed

Branch Device Type Transformer

Allow Consolidation

Length 0.00

Calculate Impedances >

Normal Status ☐ Open ☒ Closed

Specify Transformer Bases and Impedances...

Has Line Shunts Line Shunts

Convert Transformer to Line Exchange From and To Buses

D-FACTS Devices on the Line Has D-FACTS

OK Save Save to Aux Cancel Help

Per Unit Impedance Parameters

Parameter	Value
Series Resistance (R)	0.000000
Series Reactance (X)	0.100000
Shunt Charging (B)	0.000000
Shunt Conductance (G)	0.000000
Magnetizing Conductance	0.000000
Magnetizing Susceptance	0.000000

Note: All Impedances above are in per unit on the system MVA and Voltage bases. Click following button to edit on Transformer Bases.

MVA Limits

Limit	Value
Limit A	400.000
Limit B	0.000
Limit C	0.000
Limit D	0.000
Limit E	0.000
Limit F	0.000
Limit G	0.000
Limit H	0.000
Limit I	0.000
Limit J	0.000
Limit K	0.000

Edit Mode X = 20.94 Y = 87.02 Selected object X = 20.57 Y = 89.01 Viewing Present

1:52 AM 01-Aug-23

Transformer 2:

project - Case: project.PWB Status: Paused | Simulator 23 Evaluation

File Case Information Draw Onlines Tools Options Add Ons Windows

Edit Mode Log Script Run Mode Mode

180 MW 87 Mvar

50%

44%

40 MW 24 Mvar

41 MW 24 Mvar

Branch Options

Transformer Number 7 From Bus 6 To Bus 1 Circuit 1

Name 7 6

Area Name 1 (1) 1 (1)

Nominal kV 9.960 152.7

Labels ... no labels

Find By Numbers Find By Names Find ...

From End Metered

Default Owner (Same as From Bus)

Display Parameters Transformer Control Fault Info Owner, Area, Zone, Sub Custom Stability Geography

Status ☐ Open ☒ Closed

Branch Device Type Transformer

Allow Consolidation

Length 0.00

Calculate Impedances >

Normal Status ☐ Open ☒ Closed

Specify Transformer Bases and Impedances...

Has Line Shunts Line Shunts

Convert Transformer to Line Exchange From and To Buses

D-FACTS Devices on the Line Has D-FACTS

OK Save Save to Aux Cancel Help

Per Unit Impedance Parameters

Parameter	Value
Series Resistance (R)	0.000000
Series Reactance (X)	0.100000
Shunt Charging (B)	0.000000
Shunt Conductance (G)	0.000000
Magnetizing Conductance	0.000000
Magnetizing Susceptance	0.000000

Note: All Impedances above are in per unit on the system MVA and Voltage bases. Click following button to edit on Transformer Bases.

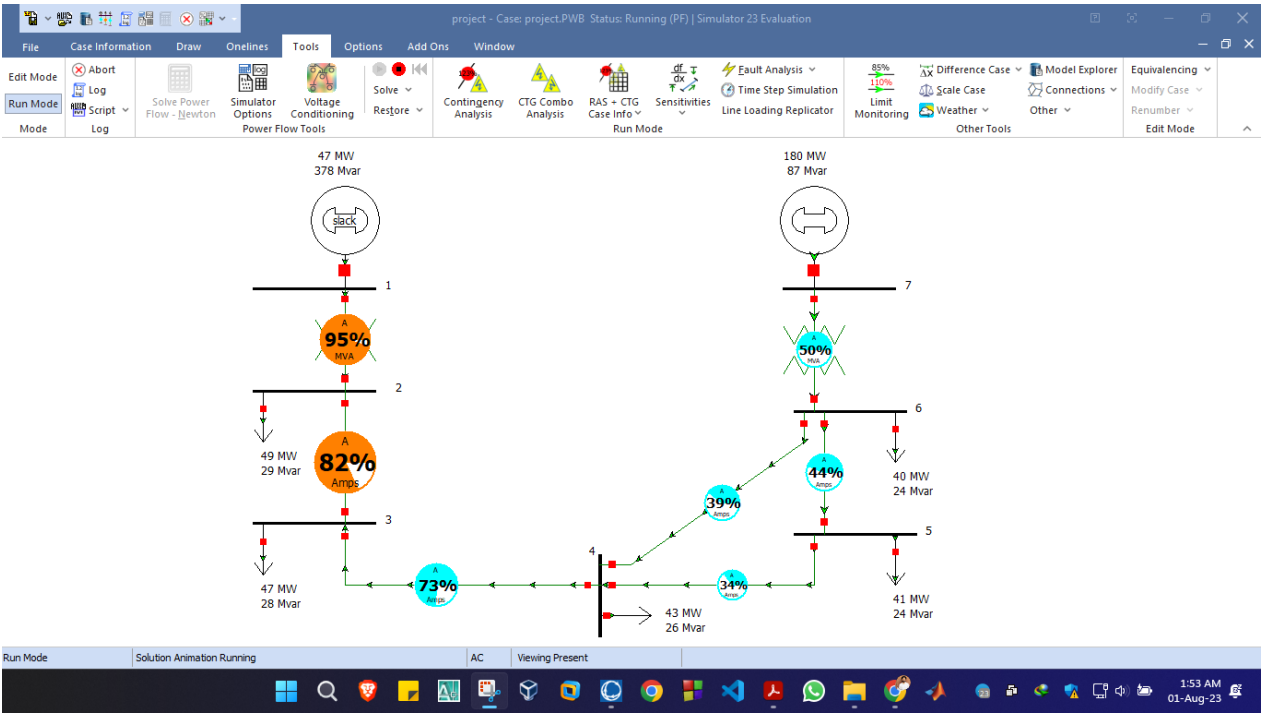
MVA Limits

Limit	Value
Limit A	400.000
Limit B	0.000
Limit C	0.000
Limit D	0.000
Limit E	0.000
Limit F	0.000
Limit G	0.000
Limit H	0.000
Limit I	0.000
Limit J	0.000
Limit K	0.000

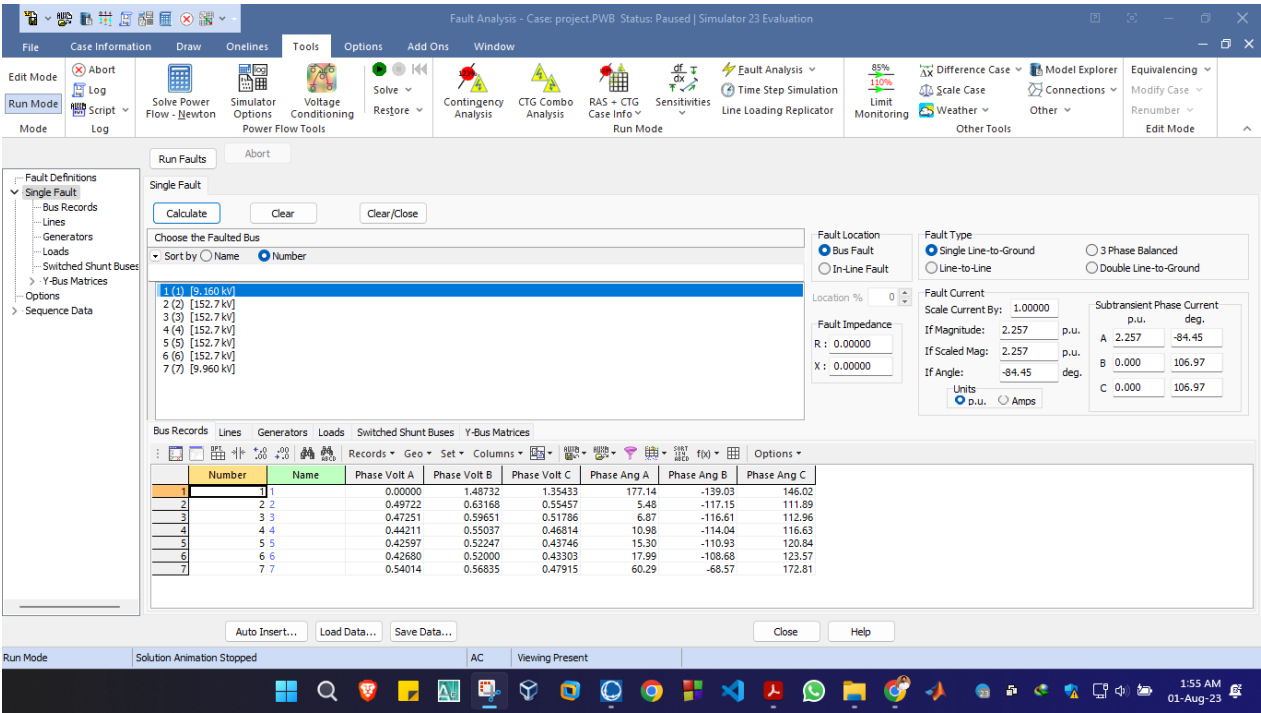
Edit Mode X = 67.03 Y = 86.20 Selected object X = 66.55 Y = 89.01 Viewing Present

1:52 AM 01-Aug-23

Simulation:



Bus Records Calculation:



Lines Calculation:

The screenshot displays the 'Fault Analysis - Case: project.PWB' interface. The 'Tools' tab is active, showing various analysis options. The 'Run Faults' section is open, displaying the 'Single Fault' configuration. The 'Choose the Faulted Bus' list shows buses 1 through 7, with bus 1 selected. The 'Fault Location' is set to 'Bus Fault'. The 'Fault Type' is 'Single Line-to-Ground'. The 'Fault Impedance' is set to 'R: 0.00000' and 'X: 0.00000'. The 'Fault Current' section shows 'Scale Current By: 1.00000', 'If Magnitude: 2.257 p.u.', 'If Scaled Mag: 2.257 p.u.', and 'If Angle: -84.45 deg.'. The 'Subtransient Phase Current' section shows 'A: 2.257 -84.45', 'B: 0.000 106.97', and 'C: 0.000 106.97'. The 'Bus Records' table is visible, showing columns for 'From Number', 'From Name', 'To Number', 'To Name', 'Circuit', 'Xfmr', 'Phase Cur A From', 'Phase Cur B From', 'Phase Cur C From', 'Phase Cur A To', 'Phase Cur B To', and 'Phase Cur C To'. The table contains data for buses 1 through 7.

From Number	From Name	To Number	To Name	Circuit	Xfmr	Phase Cur A From	Phase Cur B From	Phase Cur C From	Phase Cur A To	Phase Cur B To	Phase Cur C To
1	1	2	2	1	YES	2.55013	3.51031	3.56881	2.55013	3.51031	3.56881
2	2	3	3	1	NO	2.26190	2.94773	3.14828	2.27689	2.96750	3.16544
3	3	4	4	1	NO	2.21870	2.61842	2.92484	2.23804	2.64736	2.94915
4	4	5	5	1	NO	1.12585	1.23698	1.39253	1.14745	1.27376	1.42313
5	5	6	6	1	NO	1.36745	1.43928	1.59783	1.38732	1.47653	1.63017
6	6	7	7	1	NO	1.66004	1.70761	1.75439	1.66164	1.71222	1.75945
7	7	7	7	1	YES	3.64534	3.75949	3.82373	3.64534	3.75949	3.82373

Generators Calculation:

The screenshot displays the 'Fault Analysis - Case: project.PWB' interface. The 'Tools' tab is active, showing various analysis options. The 'Run Faults' section is open, displaying the 'Single Fault' configuration. The 'Choose the Faulted Bus' list shows buses 1 through 7, with bus 1 selected. The 'Fault Location' is set to 'Bus Fault'. The 'Fault Type' is 'Single Line-to-Ground'. The 'Fault Impedance' is set to 'R: 0.00000' and 'X: 0.00000'. The 'Fault Current' section shows 'Scale Current By: 1.00000', 'If Magnitude: 2.257 p.u.', 'If Scaled Mag: 2.257 p.u.', and 'If Angle: -84.45 deg.'. The 'Subtransient Phase Current' section shows 'A: 2.257 -84.45', 'B: 0.000 106.97', and 'C: 0.000 106.97'. The 'Bus Records' table is visible, showing columns for 'Number of Bus', 'Name of Bus', 'Phase Cur A', 'Phase Cur B', 'Phase Cur C', 'Phase Ang A', 'Phase Ang B', and 'Phase Ang C'. The table contains data for buses 1 and 2.

Number of Bus	Name of Bus	Phase Cur A	Phase Cur B	Phase Cur C	Phase Ang A	Phase Ang B	Phase Ang C
1	1	4.80682	3.51031	3.56881	-84.38	165.80	28.02
2	7	3.64533	3.75949	3.82373	22.28	-95.56	141.89

Loads Calculation:

Single Fault Configuration

Choose the Faulted Bus: **1 (1) [9, 160 kV]**

Sort by: ☐ Name ☒ Number

Bus Records Table:

Number of Bus	Name of Bus	ID	Phase Cur A	Phase Cur B	Phase Cur C
1	2	1	0.72419	0.93203	0.80772
2	3	1	0.75357	0.95133	0.82590
3	4	1	0.78763	0.98048	0.83399
4	5	1	0.80785	0.99086	0.82965
5	6	1	0.81618	0.99441	0.82809

Fault Location: ☒ Bus Fault ☐ In-Line Fault

Fault Type: ☒ Single Line-to-Ground ☐ Line-to-Line ☐ 3 Phase Balanced ☐ Double Line-to-Ground

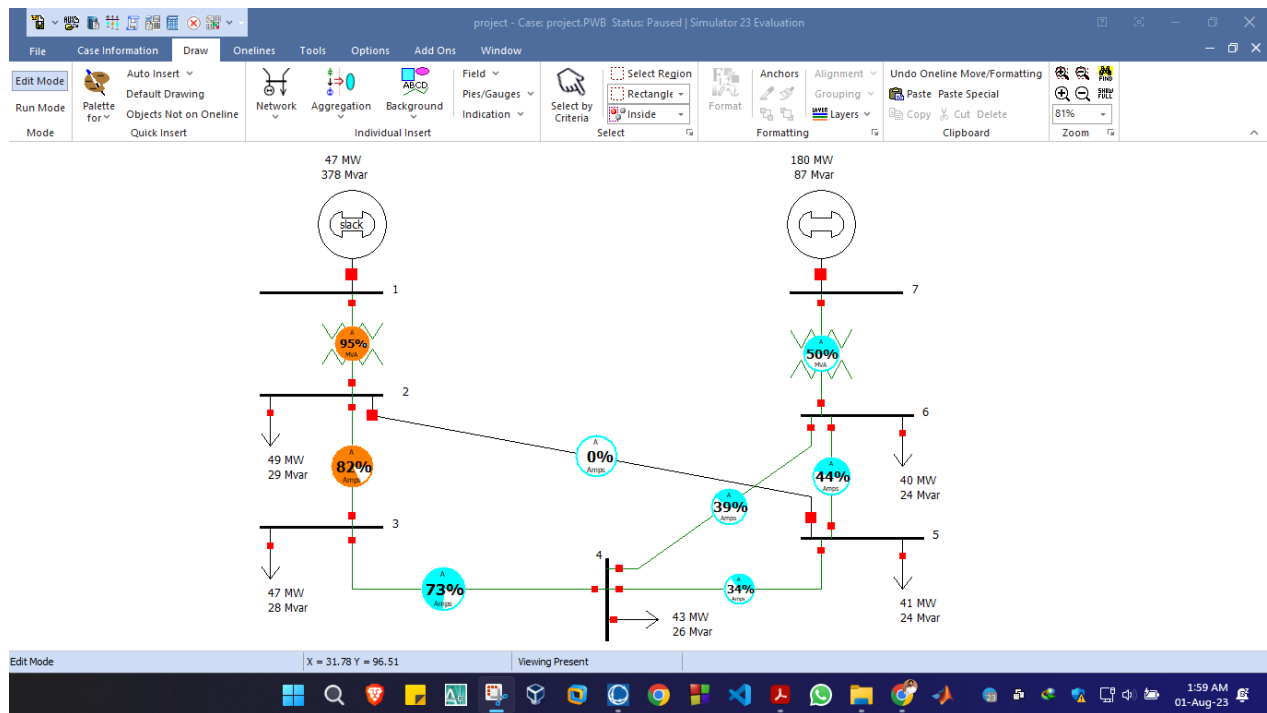
Fault Impedance: R: 0.00000, X: 0.00000

Fault Current: Scale Current By: 1.00000

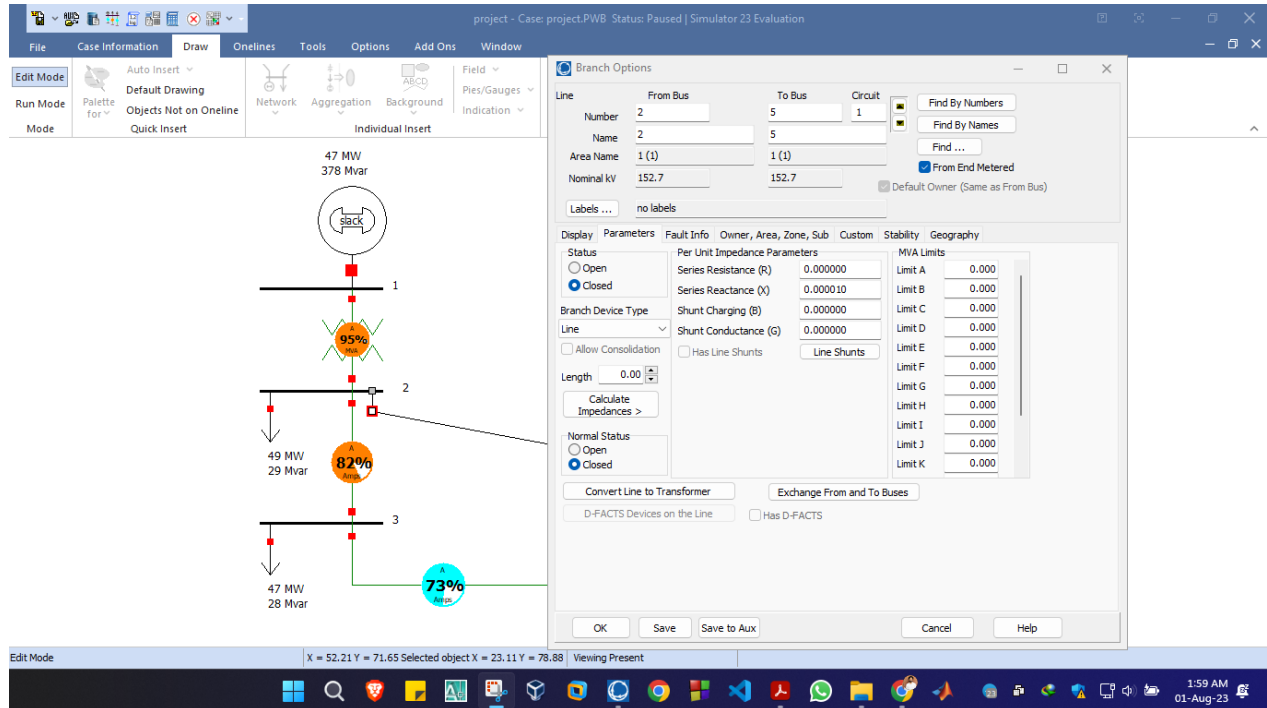
Subtransient Phase Current:

	p.u.	deg.
A	2.257	-84.45
B	0.000	106.97
C	0.000	106.97

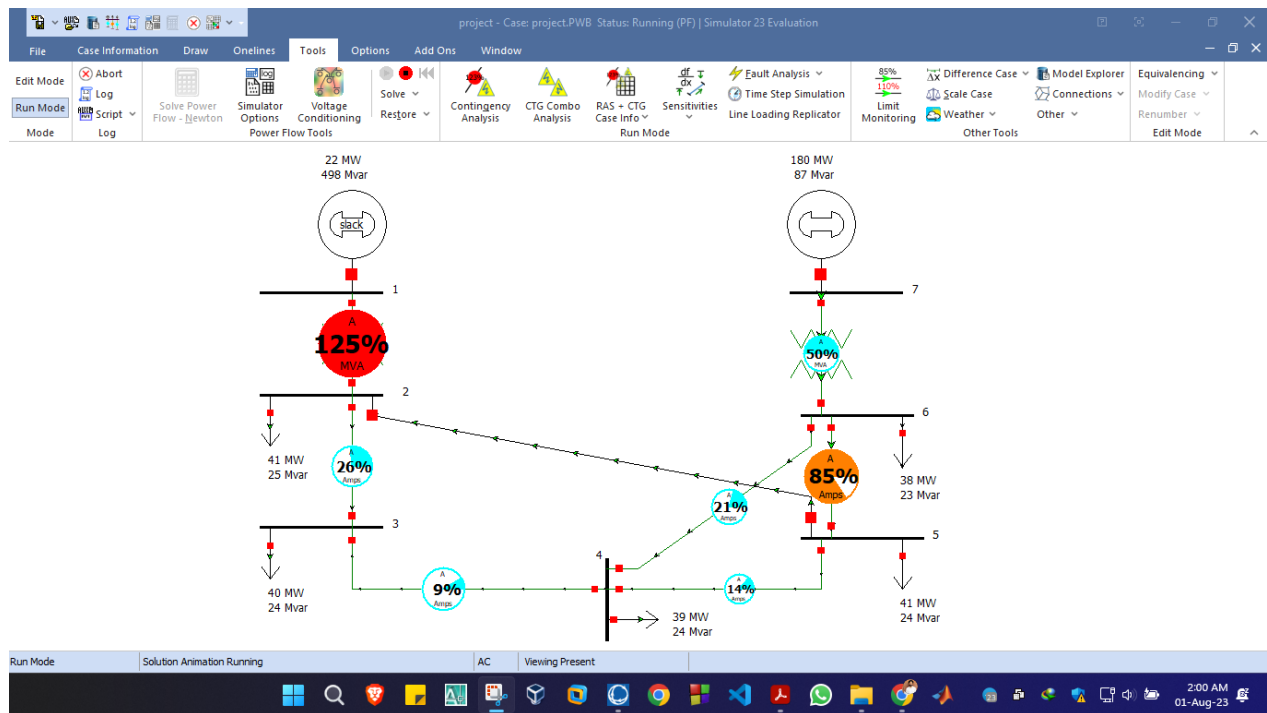
Line to Line Fault Bus-2 to Bus-5 System:



Line to Line Fault Bus-2 to Bus-5 System Line Values:



Line to Line Fault Bus-2 to Bus-5 System Simulink:



Line to Line Fault Bus-2 to Bus-5 System Calculation:

The screenshot displays the 'Fault Analysis' software interface. The 'Single Fault' tab is active, showing a list of buses and a table of fault records. The fault is defined as a line-to-line fault between Bus 2 and Bus 5. The fault current is calculated as 4.690 p.u. with a phase angle of -134.43 degrees. The fault impedance is 0.00000 p.u.

Single Fault

Calculate Clear Clear/Close

Choose the Faulted Line

Sort by ☐ Name ☒ Number

Search For Near Bus: 1 (1) [9.160 kV] 2 (2) [152.7 kV] 3 (3) [152.7 kV] 4 (4) [152.7 kV] 5 (5) [152.7 kV] 6 (6) [152.7 kV] 7 (7) [9.960 kV]

Select Far Bus, OKT: 1 (1) [9.160 kV] OKT 1 3 (3) [152.7 kV] OKT 1 5 (5) [152.7 kV] OKT 1

Fault Location: ☒ Bus Fault ☐ In-Line Fault

Fault Type: ☒ Single Line-to-Ground ☐ Line-to-Line ☐ 3 Phase Balanced ☐ Double Line-to-Ground

Location %: 0

Fault Impedance: R: 0.00000 X: 0.00000

Fault Current: Scale Current By: 1.00000

If Magnitude: 4.690 p.u. If Scaled Mag: 4.690 p.u. If Angle: -134.43 deg.

Subtransient Phase Current: A 0.000 0.00 deg. B 4.690 -134.43 deg. C 4.690 45.57 deg.

Units: ☒ p.u. ☐ Amps

From Number	From Name	To Number	To Name	Circuit	Xfmr	Phase Cur A From	Phase Cur B From	Phase Cur C From	Phase Cur A To	Phase Cur B To	Phase Cur C To
1	1	2	2	1	YES	4.98165	5.34333	5.31040	4.98165	5.34333	5.31040
2	2	3	3	1	NO	1.04791	0.81900	0.24593	1.06009	0.82551	0.25012
3	2	5	5	1	NO	3.82112	4.76016	2.19609	3.82112	4.76016	2.19609
4	3	4	4	1	NO	0.34126	0.43936	0.22883	0.36592	0.45193	0.22237
5	4	5	5	1	NO	0.55795	0.58069	0.04420	0.51787	0.56153	0.05269
6	4	6	6	1	NO	0.84507	0.74822	0.75425	0.86840	0.77158	0.73996
7	5	6	6	1	NO	3.38477	3.92352	2.61668	3.39706	3.93084	2.61244
8	7	6	6	1	YES	4.53198	4.48989	3.89012	4.53198	4.48989	3.89012

Auto Insert... Load Data... Save Data... Close Help

The screenshot displays the 'Fault Analysis' software interface. The 'Single Fault' tab is active, showing a list of buses and a table of fault records. The fault is defined as a line-to-line fault between Bus 2 and Bus 5. The fault current is calculated as 4.690 p.u. with a phase angle of -134.43 degrees. The fault impedance is 0.00000 p.u.

Single Fault

Calculate Clear Clear/Close

Choose the Faulted Line

Sort by ☐ Name ☒ Number

Search For Near Bus: 1 (1) [9.160 kV] 2 (2) [152.7 kV] 3 (3) [152.7 kV] 4 (4) [152.7 kV] 5 (5) [152.7 kV] 6 (6) [152.7 kV] 7 (7) [9.960 kV]

Select Far Bus, OKT: 1 (1) [9.160 kV] OKT 1 3 (3) [152.7 kV] OKT 1 5 (5) [152.7 kV] OKT 1

Fault Location: ☒ Bus Fault ☐ In-Line Fault

Fault Type: ☒ Single Line-to-Ground ☐ Line-to-Line ☐ 3 Phase Balanced ☐ Double Line-to-Ground

Location %: 0

Fault Impedance: R: 0.00000 X: 0.00000

Fault Current: Scale Current By: 1.00000

If Magnitude: 4.690 p.u. If Scaled Mag: 4.690 p.u. If Angle: -134.43 deg.

Subtransient Phase Current: A 0.000 0.00 deg. B 4.690 -134.43 deg. C 4.690 45.57 deg.

Units: ☒ p.u. ☐ Amps

From Number	From Name	To Number	To Name	Circuit	Xfmr	Phase Cur A From	Phase Cur B From	Phase Cur C From	Phase Cur A To	Phase Cur B To	Phase Cur C To
1	1	2	2	1	YES	4.98165	5.34333	5.31040	4.98165	5.34333	5.31040
2	2	3	3	1	NO	1.04791	0.81900	0.24593	1.06009	0.82551	0.25012
3	2	5	5	1	NO	3.82112	4.76016	2.19609	3.82112	4.76016	2.19609
4	3	4	4	1	NO	0.34126	0.43936	0.22883	0.36592	0.45193	0.22237
5	4	5	5	1	NO	0.55795	0.58069	0.04420	0.51787	0.56153	0.05269
6	4	6	6	1	NO	0.84507	0.74822	0.75425	0.86840	0.77158	0.73996
7	5	6	6	1	NO	3.38477	3.92352	2.61668	3.39706	3.93084	2.61244
8	7	6	6	1	YES	4.53198	4.48989	3.89012	4.53198	4.48989	3.89012

Auto Insert... Load Data... Save Data... Close Help

Discussion

In this project, I have implemented a power system having two generator, two transformer, seven buses and four loads. I have used bus 1 as swing bus and bus 2, 3, 4, 5, 6 as load bus and bus 7 as generator bus. First I have calculated all the values and entered the values in the power world software to design the required system. Completing the system, I have analyzed bus records, lines, loads, generator values from the calculator. After this, I made a line to line fault by connecting a transmission line from bus 2 to bus 5 and analyzed the values from the fault analysis calculator.