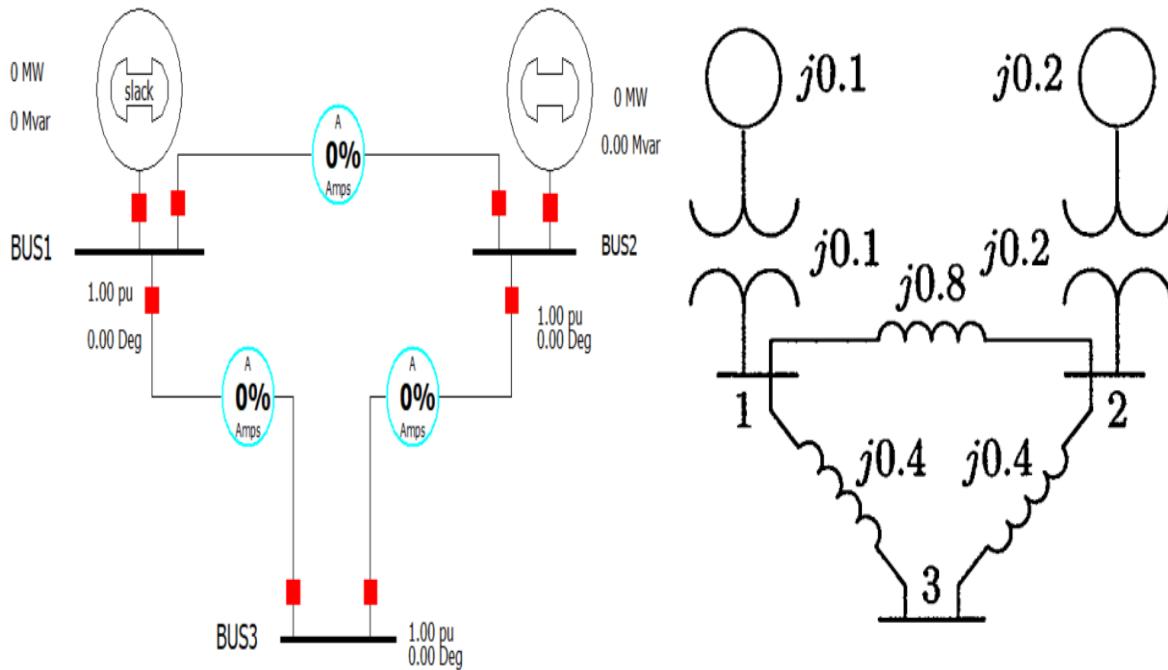


### Problem 1:(Fault occurs in BUS 3)



**Figure1:** Fault Analysis problem 1

# Determine the fault current, the bus voltages, the bus voltages, and the line currents during the fault when a balanced three-phase fault with a fault impedance  $Z_f=0.16$  per unit occurs on.

#### Experimental data table:

At  $Z_f=0.0$  ohm

Number	Name	Phase Volt A	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C
1	BUS1	0.65723	0.65723	0.65723	2.06	-117.94	122.06
2	BUS2	0.62017	0.62017	0.62017	15.49	-104.51	135.49
3	BUS3	0	0	0	90	90	90

At  $Z_f=0.16$  ohm

Number	Name	Phase Volt A	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C
1	BUS1	0.77333	0.77333	0.77333	2.02	-117.98	122.02
2	BUS2	0.74856	0.74856	0.74856	9.5	-110.5	129.5
3	BUS3	0.33748	0.33748	0.33748	5.7	-114.3	125.7

### Fault Current,Subtransient phase Current(p.u,deg):

The screenshot shows a software application window for fault analysis. At the top, there are three buttons: 'Calculate' (highlighted in blue), 'Clear', and 'Clear/Close'. Below these are two dropdown menus: 'Choose the Faulted Bus' and 'Sort by' (with options 'Name' and 'Number').

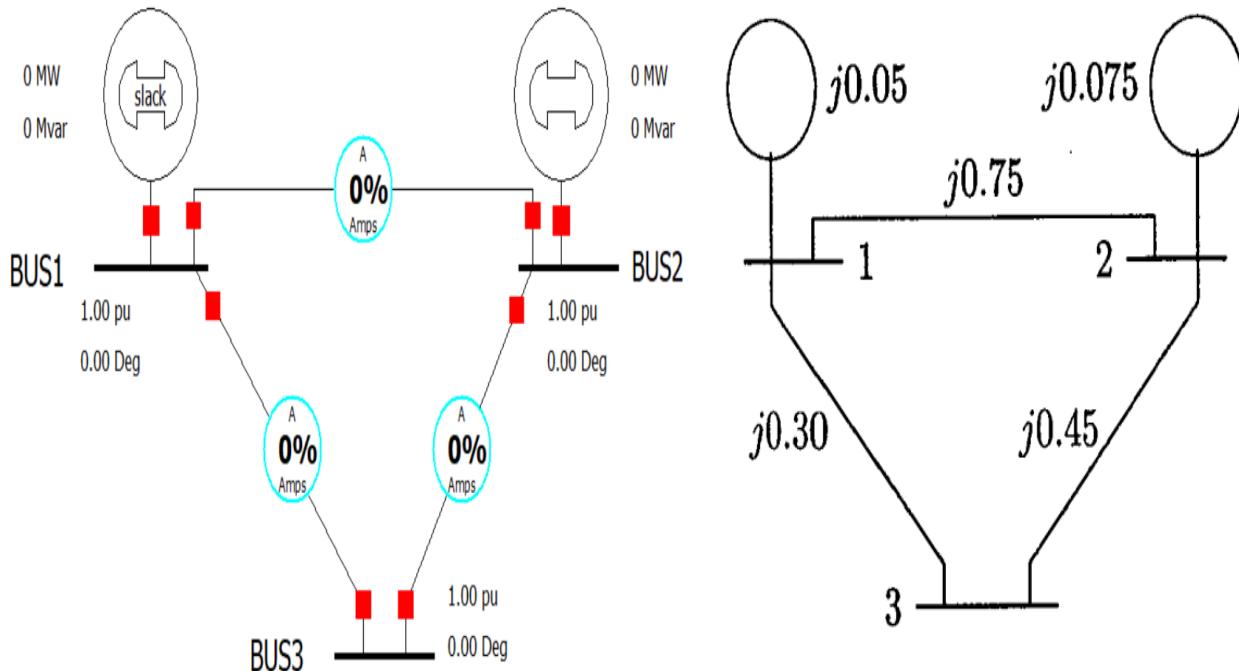
The main area displays a list of buses:

- 1 (BUS1) [138.0 kV]
- 2 (BUS2) [138.0 kV]
- 3 (BUS3) [138.0 kV] (selected)

To the right of the bus list are several configuration parameters:

- Fault Location:** Bus Fault (selected), In-Line Fault.
- Fault Type:** 3 Phase Balanced (selected), Single Line-to-Ground, Line-to-Line, Double Line-to-Ground.
- Fault Impedance:** R: 0.00000, X: 0.16.
- Location %:** 0.
- Fault Current:** Scale Current By: 1.00000, If Magnitude: 2.109 p.u., If Scaled Mag: 2.109 p.u., If Angle: -84.30 deg.
- Subtransient Phase Current:** p.u., deg. (A: 2.109, B: 2.109, C: 2.109), 155.70 deg.
- Units:** p.u., Amps.

### Problem 2:(Fault occurs in BUS 3)



**Figure 2:** Fault Analysis problem 2

# Determine the fault current, the bus voltages, the bus voltages, and the line currents during the fault when a balanced three-phase fault with a fault impedance  $Z_f=0.19$  per unit occurs on.

#### Experimental data table:

At  $Z_f=0.0$  ohm

Number	Name	Phase Volt A	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C
1	BUS1	0.75	0.75	0.75	0	-120	120
2	BUS2	0.75	0.75	0.75	0	-120	120
3	BUS3	0	0	0	90	90	90

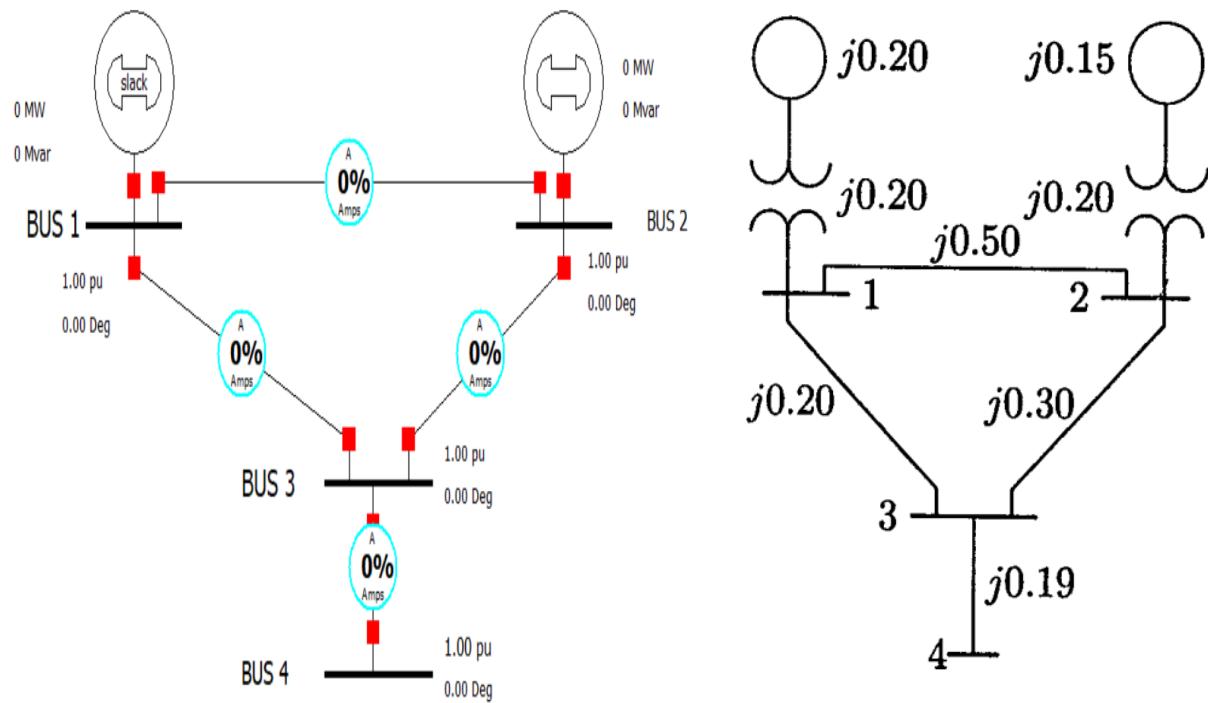
At  $Z_f = 0.19$  ohm

Number	Name	Phase Volt A	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C
1	BUS1	0.86047	0.86047	0.86047	0	-120	120
2	BUS2	0.86047	0.86047	0.86047	0	-120	120
3	BUS3	0.44186	0.44186	0.44186	0	-120	120

Fault Current, Subtransient phase Current(p.u,deg):

The screenshot shows a software window for fault calculations. At the top are three buttons: 'Calculate' (highlighted in blue), 'Clear', and 'Close'. Below these is a dropdown menu 'Choose the Faulted Bus' with 'Sort by' options 'Name' (unchecked) and 'Number' (checked). The list contains three items: '1 (BUS1) [138.0 kV]', '2 (BUS2) [138.0 kV]', and '3 (BUS3) [138.0 kV]', with '3 (BUS3)' currently selected. To the right of the bus selection are 'Fault Location' and 'Fault Type' sections. Under 'Fault Location', 'Bus Fault' is selected. Under 'Fault Type', '3 Phase Balanced' is selected. Below these are 'Location %' (set to 0), 'Fault Impedance' (R: 0.00000, X: 0.19), and 'Scale Current By' (1.00000). On the far right, there's a 'Subtransient Phase Current' section showing values for phases A, B, and C: A 2.326 p.u., -90.00 deg.; B 2.326 p.u., 150.00 deg.; C 2.326 p.u., 30.00 deg. There are also 'Units' buttons for 'p.u.' and 'Amps'.

### Problem 3:(Fault occurs in BUS 4)



**Figure3:** Fault Analysis problem 3

# Determine the fault current, the bus voltages, the bus voltages, and the line currents during the fault when a balanced three-phase fault with a fault impedance  $Z_f=0.16$  per unit occurs on.

#### Experimental data table:

At  $Z_f=0.0$  ohm

Number	Name	Phase Volt A	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C
1	BUS 1	0.6	0.6	0.6	0	-120	120
2	BUS 2	0.65	0.65	0.65	0	-120	120
3	BUS 3	0.38	0.38	0.38	0	-120	120
4	BUS 4	0	0	0	90	90	90

**At  $Z_f = 0.0225 \text{ ohm}$**

Number	Name	Phase Volt A	Phase Volt B	Phase Volt C	Phase Ang A	Phase Ang B	Phase Ang C
1	BUS 1	0.60866	0.60866	0.60866	0	-120	120
2	BUS 2	0.64074	0.64074	0.64074	0	-120	120
3	BUS 3	0.38091	0.38091	0.38091	0	-120	120
4	BUS 4	0	0	0	0	-116.57	116.57

**Fault Current,Subtransient phase Current(p.u,deg):**

The screenshot shows a software window for fault analysis. At the top, there are three buttons: 'Calculate' (highlighted in blue), 'Clear', and 'Clear/Close'. Below these are two dropdown menus: 'Choose the Faulted Bus' and 'Sort by' (with options 'Name' and 'Number').

In the center-left, a list of buses is shown with their names and voltages: 1 (BUS 1) [138.0 kV], 2 (BUS 2) [138.0 kV], 3 (BUS 3) [138.0 kV], and 4 (BUS 4) [138.0 kV]. The fourth item, '4 (BUS 4) [138.0 kV]', is highlighted with a blue selection bar.

To the right, there are several configuration sections:

- Fault Location:** Set to 'Bus Fault' (radio button selected).
- Fault Type:** Set to '3 Phase Balanced' (radio button selected).
- Fault Impedance:** Shows 'R: 0.00000' and 'X: 0.0225'.
- Fault Current:** Shows 'Scale Current By: 1.00000'. Below it are fields for 'If Magnitude:', 'If Scaled Mag:', and 'If Angle:'.
- Subtransient Phase Current:** Shows columns for 'p.u.' and 'deg.' with values A: 1.914, -90.00; B: 1.914, 150.00; and C: 1.914, 30.00.
- Units:** Set to 'p.u.' (radio button selected).