Laboratory Experiment 12

Transmission Line Short Circuit Faults using MATLAB and PowerWorld, and Overloading of Transmission Lines using *PowerWorld*

Objectives: To study the effect of short-circuit faults and overloading of transmission lines.

Laboratory Tasks and Report:

1. Simulate the fault in Example 13-2. The MATLAB file for this example is **SimpleSystemFault.m**, which is located in this Folder. First launch MATLAB and open this file through it, and then execute it. Using the program code given, change the code for a three phase and a single line to ground fault at bus 3 instead of bus 2. Show the code for the bus 3 fault in your report.

2. The *PowerWorld* file for Example 13-2 is **SimpleSystemFault.pwb**; double click on it and compare results with that from the MATLAB simulation. Under Run Mode find Fault Analysis and click on it, then select bus 2 in the window marked "Choose the faulted bus." Then select "Bus Fault", and either three phase or single line to ground. When you are done with selections hit "calculate" in the lower left. You can cause the results to be displayed on the one line by selecting "All Phases" in the one line box and you can show results in either pu or in Amps. You should do both three phase and one line to ground faults at both bus 2 and bus 3 and compare to the Matlab results you got.

3. The PowerWorld file for this example is **ShortCircuitFault.pwb** (see video clips# 16 and 17), which is located in this Folder. Open the file and run it. Calculate three phase and single line to ground faults at bus 1, on the 1 to 3 line half way between bus 1 and 3 and on bus 3.

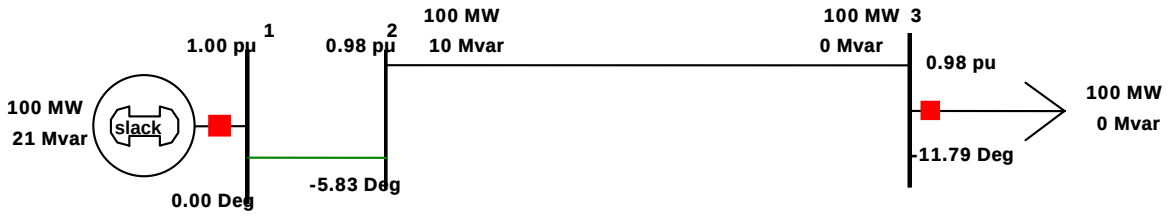
   For the line fault you need to click on the line fault tab and tell the program where on line 1 to 3 to place the fault.

   For each fault type and location you are to capture the results on the diagram showing the currents in amperes for all three phases. Which fault has the largest fault currents.

SimpleSystemFault.m

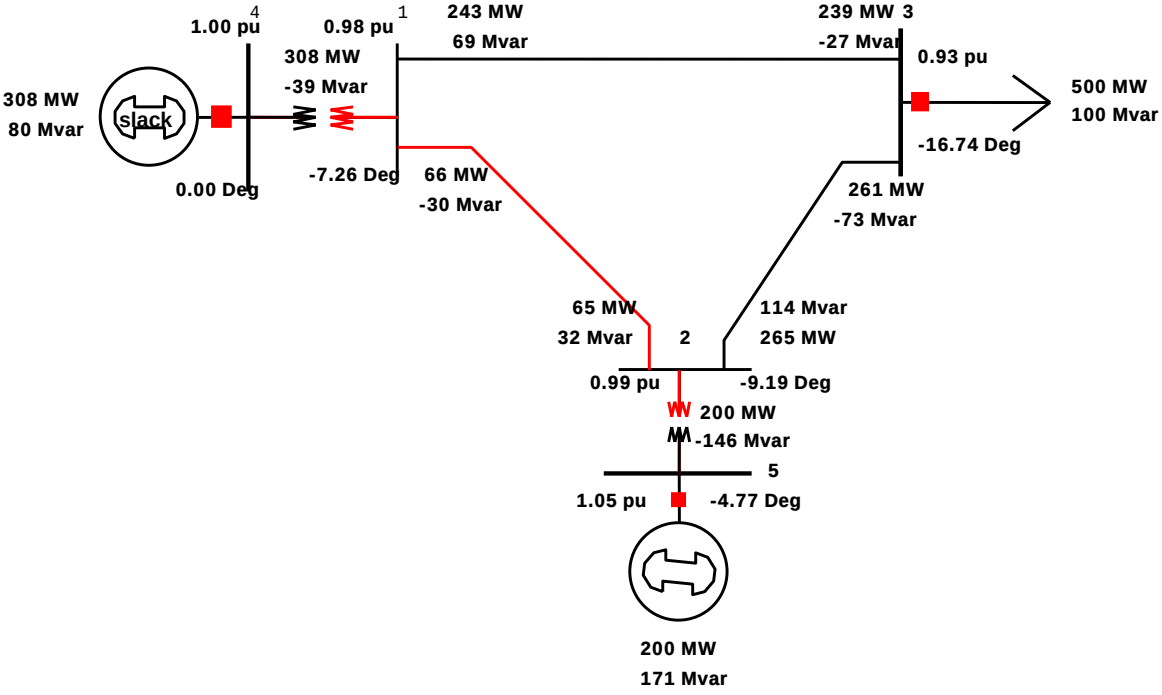
```
% Example 13-2; simple system
% Fault; 3-phase at bus 2
%Pre-Fault
V3_a1=0.98*exp(-j*11.79*pi/180);
I3_a1=(1/0.98)*exp(-j*11.79*pi/180);
Rload=0.98*0.98,
Ea=1+j*0.12*I3_a1,
[Th_Ea,Amp_Ea]=cart2pol(real(Ea),imag(Ea));
Th_Ea_deg=Th_Ea*180/pi,
Amp_Ea
Power=Ea*conj(I3_a1),
% 3-phase fault at bus 2
Ifault=Ea/(j*(0.12+0.1)),
[ang,Ifault_Mag]=cart2pol(real(Ifault),imag(Ifault));
Ifault_AngDEG=ang*180/pi,
Ifault_Mag
% SLG fault at bus 2
ITH=Ea/(j*0.32+Rload);
VTH=(j*0.1+Rload)*ITH;
ZTH=(j*0.1+Rload)*(j*0.22)/((j*0.1+Rload)+(j*0.22));
Z2=(j*0.1+Rload)*(j*0.22)/((j*0.1+Rload)+(j*0.22));
Z0=(j*0.2+Rload)*(j*0.10)/((j*0.2+Rload)+(j*0.10)); % delta wye-
grounded transfomer bypasses X0 of generator
Ia1=VTH/(ZTH+Z2+Z0);
Ifault=3*Ia1;
[ang,Ifault_Mag]=cart2pol(real(Ifault),imag(Ifault));
Ifault_AngDEG=ang*180/pi,
Ifault_Mag
```

SimpleSystemFault.pwb



Example 13-2
Simple system Fault

ShortCircuitFault.pwb



Example 13-3