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Universiti Malaysia PAHANG
Engineering • Technology • Creativity

Faculty of Electrical & Electronics Engineering
DEE3143 Basic Electrical Machine & Power Systems

ASSIGNMENT #2

1) A transmission line system consists of a generator, a step up transformer, transmission line, a step down transformer and a load. The following components apply to each component. Build the per unit impedance diagram for the power system. Use the base values at generator side:

G	:	130 MVA	11 kV	$X_G = 16\%$
SUT	:	135 MVA	11/132 kV	$X_{SUT} = 15\%$
Line	:	4 + j12 Ω		
SDT	:	125 MVA	132/11 kV	$X_{SDT} = 11.2\%$
Load	:	125 MW at unity PF and 11 kV		

2) The one-line diagram of a three-phase power system is shown in Figure 1. The manufacturer's data for each device is given as follow:

G1:	50MVA	20 kV	X=10%
M:	30MVA	18 kV	X=8%
T1:	30MVA	20 / 200 kV	X=10%
T2:	30MVA	200 / 20 kV	X=10%
line:		200 kV	Z=100+j200Ω

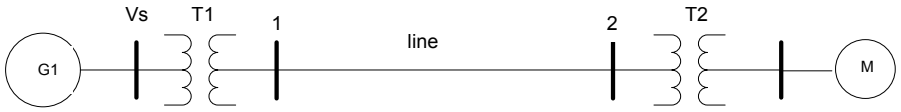

Figure 1

Develop the impedance equivalent diagram for the power system. Mark impedance in per-unit. Select a common base of 50 MVA and 20kV as the voltage base for generator.

3. A 100 MVA, 33 kV, three-phase generator is connected to the motor through a transmission line as shown in Figure 2 below.

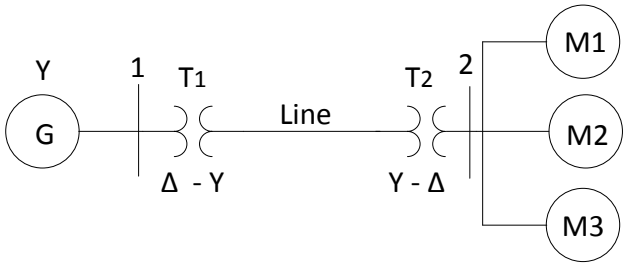

Figure 2

The generator, transmission line and transformers are rated as follows:

G	:	100 MVA	33 kV	X=15%
Three-phase Δ-Y transformer:				
T_1	:	110 MVA	32Δ /110Y kV	X=8%
Three-phase Y-Δ transformer:				
T_2	:	110 MVA	110Y/32Δ kV	X=8%
Three-phase motor:				
M_1	:	40 MVA	30 kV	X=20%
M_2	:	30 MVA	30 kV	X=20%
M_3	:	20 MVA	30 kV	X=20%
Line	:	X=60 Ω		

Build the per-unit equivalent circuit diagram of the system as shown in Figure 2. Choose the base values in the circuit of generator.

4) Figure 5 shows the schematic diagram of a three phase power system. The network data are given below:

G:	140 MVA	22 kV	$X_G = 0.28$ pu
T1:	60 MVA	22/220 kV	$X_{T1} = 0.12$ pu
T2:	60 MVA	220/11kV	$X_{T2} = 0.09$ pu
T3:	80 MVA	22/110kV	$X_{T3} = 0.128$ pu
T4:	60 MVA	110/11kV	$X_{T4} = 0.12$ pu
Motor:	60 MVA	10.45kV	$X_{Load-1} = 0.167$ pu

$X_{line1} = 66.62\ \Omega$

$X_{line2} = 88.41\ \Omega$

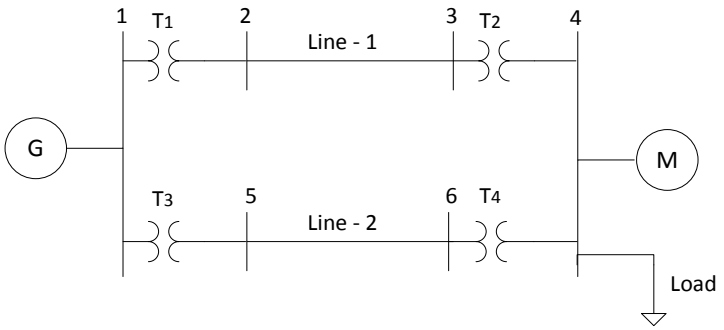

Figure 3

The Load is 55 MVA and it operates at 10.45 kV, 0.75 power factor lagging. By selecting a common base of 100 MVA, and 22kV at generator side, draw the impedance diagram showing all impedances in per unit.

5. The one-line diagram of a three-phase power system is shown in Figure 4. Draw the impedance equivalent circuit for the power system. Mark all impedance in per-unit. Select a common base of 50 MVA and 20 kV at bus 1 near the generator G1.

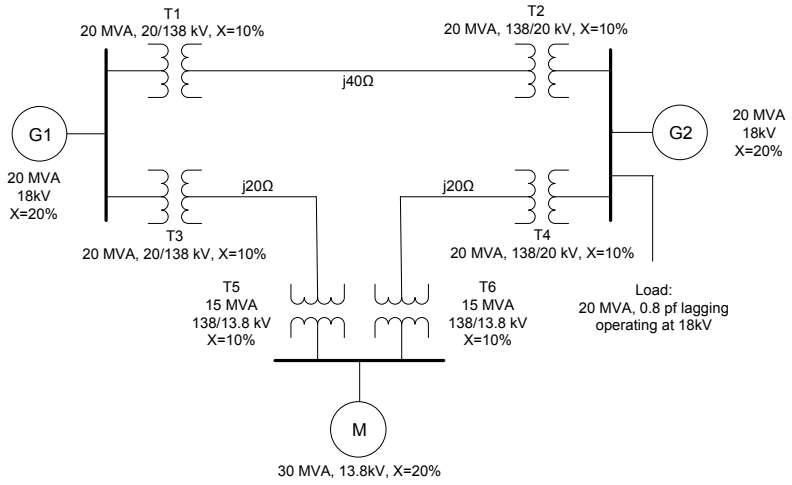

Figure 4