Eastern Regional Power Committee
14 Golf Club Road, Tollygunge,
Kolkat, West Bengal 700033

Power Research and Development Consultants Pvt., Ltd.,
#5, 11th Cross, 2nd Stage,
West of Chord Road,
Bangalore- 560 086, India
Ph: +91-080-4245 5555
E-mail: prdc@vsnl.com

MiP-PSCT Training Solution Sheet

Date of Assignment: 31/07/2017

1. Problem definition:

A. A major industrial plant is planned having a 0.85 pf load requirement of about 80 MW peak at 33 kV systems. The minimum loading in the plant is 40 MW at 0.95 pf at 33 kV systems. The average load in the plant is 60 MW at 0.9 pf. The plant is having the 220 kV grid at a distance of about 10 Kms. Design the suitable grid interconnection and step down transformer to distribute the power at 33 kV. The grid voltage varies from 200 kV to 240 kV and it is desired to maintain the voltage at 33 kV bus in the range ± 3%.

B. Determine if reactive power support is required at 33 kV bus to maintain the bus voltage within the range. If yes then determine the required reactive power support.

Data: Transformer impedance: 12%. Maximum fault level at 220 kV: 5000 MVA.

Answer:

Transformer :

120 MVA , 12% , 220 / 33 Kv, Tap voltage range -0.85/+1.05

Shunt capacitor :

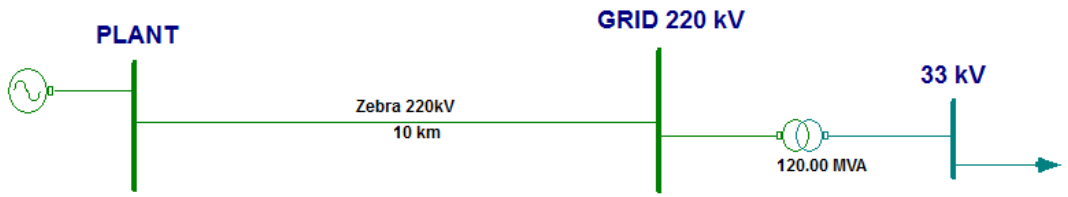
20 MVAr , 33kv

Plant Voltgae : 0.95 pu

With the above rating following results are obtained at different loading.

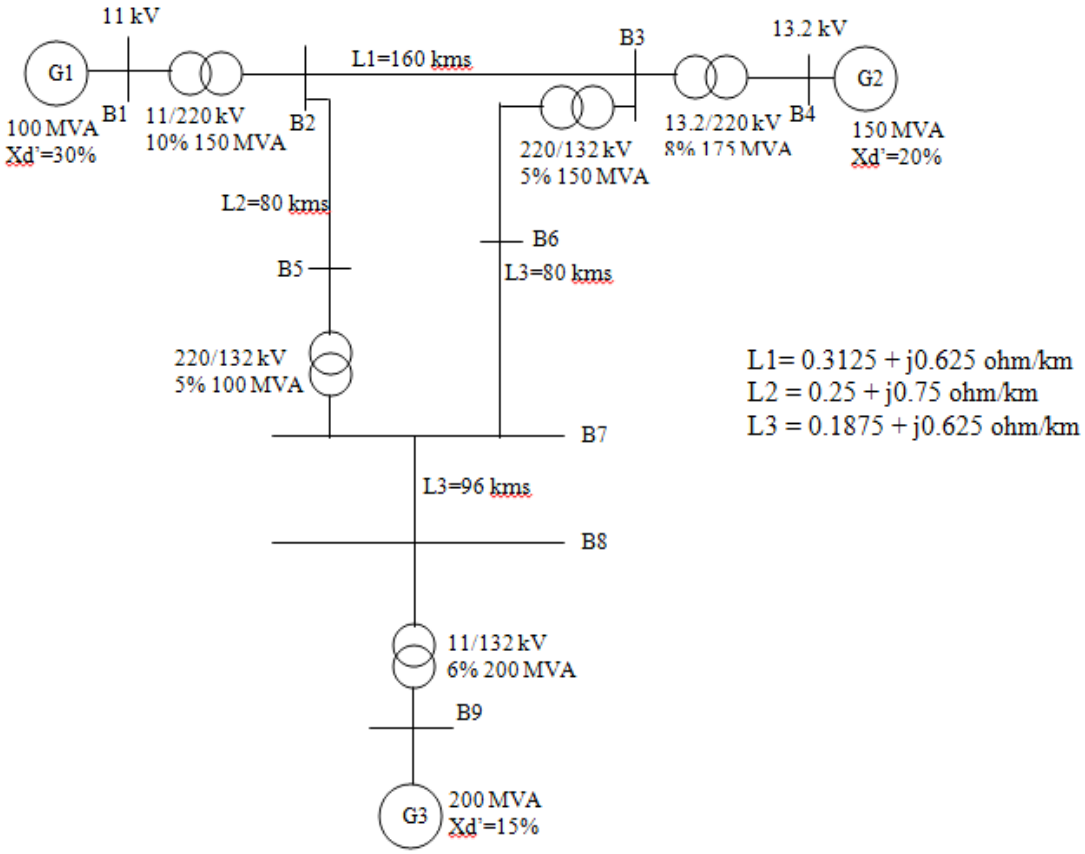
Loading @ 33 kV Bus	Voltage @ 33 kV Bus	Tap No.
Peak Load 80MW @ 0.85 pf	0.98pu	7
Average Load 60 MW @ 0.90 pf	1.01pu	7
Minimum Load 40 MW @ 0.95 pf	1.025 pu	7

From the above results, it is seen that, with the above rating transformer and shunt compensation, the voltage at 33 kV bus is maintained within +3 % to -3 % (of its rated value).



2. Problem definition:

Determine the fault level at all the buses for the given system



Answer:

---

3 phase to ground fault Levels:

Bus No.	Bus Name	Bus Voltage	Fault Level (in MVA)	Fault Current (in kA)
1	Bus1	11	658.6	34.568
2	Bus2	220	687.5	1.804
3	Bus3	220	850.4	2.232
4	Bus4	13.2	1007.2	44.053
5	Bus5	220	590.6	1.55
6	Bus6	132	717.02	3.136
7	Bus7	132	619.98	2.712
8	Bus8	132	1114.5	4.875
9	Bus9	11	1487.3	78.065