Printed Pages : 3 **Roll No.** | | | | | | | | | | | **EEE601**

B.TECH.

THEORY EXAMINATION (SEM–VI) 2016-17

POWER SYSTEM ANALYSIS

Time : 3 Hours ***Max. Marks : 100***

Note : *Be precise in your answer.*

SECTION-A

1 Explain the following: **(10×2=20)**

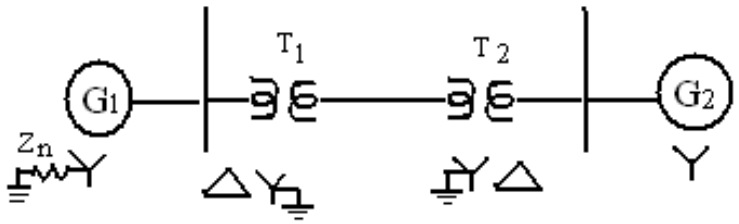
a) Show that line and phase voltages in per unit are equal.

b) Establish the relation between zero sequence current and neutral current

c) A generator is rated at 30 MVA, 11kV and has reactance of 20%. Calculate it's per unit reactance for 50 MVA, 10 kV base

d) Define the term short circuit capacity.

e) Draw zero sequence network for the power system whose one line diagram is given below



f) What do you understand by load flow analysis?

g) Define transient stability.

h) What is critical clearing time?

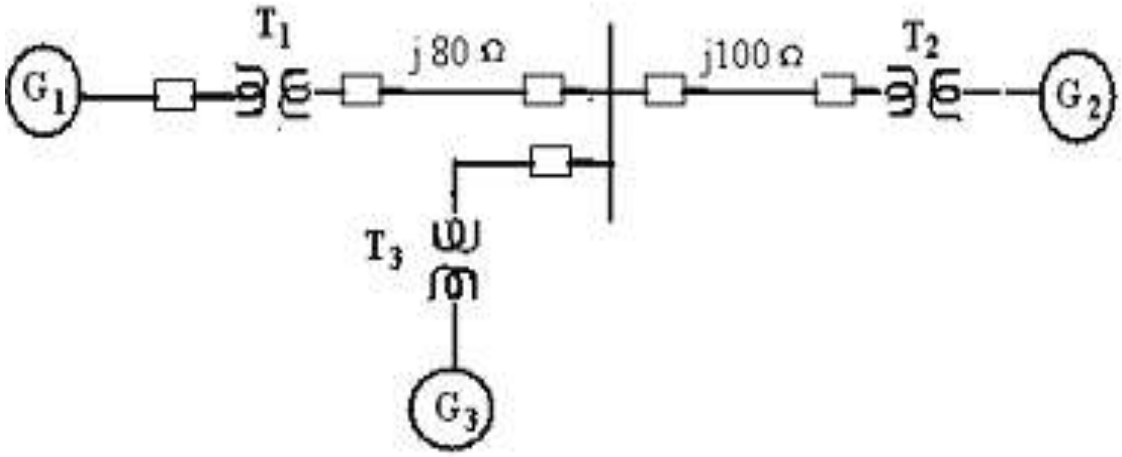
i) Write any two reasons, due to which voltage surge is generated.

j) What Bewley's lattice diagram represents?

SECTION-B

2 Attempt any five of the following: **(10×5=50)**

a) The single line diagram of an unloaded power system is shown in the figure below. The reactances of the two sections of the transmission line are shown in the diagram.The generators and transformers are rated as follows:



Generator 1: 20 MVA, 13.8 kV, X'' = 0.2 pu

Generator 2: 30 MVA, 18 kV, X'' = 0.2 pu

Generator 3: 30 MVA, 20 kV, X'' = 0.2 pu

Transformer 1: 25 MVA, 13.8/220 kV, X = 10%

Transformer 2: 30 MVA, 18/220 kV, X = 10%

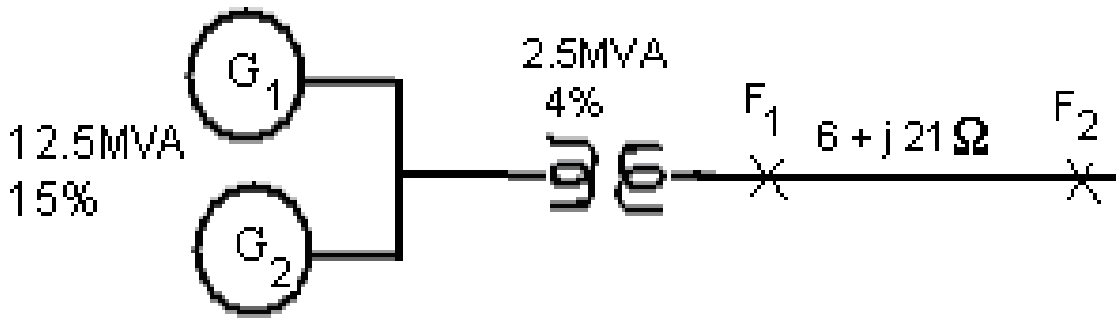
Transformer 3: 35 MVA, 20/220 kV, X = 10%

Draw the impedance diagram with all the reactances marked in per unit for the power system shown in the figure. Neglect the resistance, and choose a base of 50MVA, 13.8 kV in the circuit of generator 1.

b) A Three phase transmission line operates at 33 kV and has an impedance of $(6 + j\,21)\ \Omega$/phase. It is connected to a generating station through a 2.5 MVA step up transformer having a percentage reactance of 4%. The generating station has two generators each of 12.5 MVA and 15% reactance as shown below. Calculate fault MVA and ampere fault current if a three phase short circuit takes place,

(i) At hv terminal of transformer (F_1)

(ii) At the end of transmission line (F_2)



c) Show that zero sequence networks does not exist for line to line (L-L) fault. Deduce the expression for per unit fault current and show the interconnections of sequence network for L-L fault. Neglect the fault impedance.

d) How the buses are classified for load flow analysis? Explain clearly with the help of flow chart the Gauss Seidel method of load flow analysis. Consider the presence of PV buses. Use acceleration factors

e) A generator operating at 50 Hz delivers 1 p.u. power to infinite bus through a transmission circuit in which resistance is ignored. A fault take place reducing the maximum power transferable to 0.5 p.u., where as before fault, this power was 2.0 p.u. and after the clearance of the fault, it is 1.5 p.u. Using of equal area criterion, determine the critical clearing angle.

f) Explain Step or Point by Point Method for solving the swing equation. Also explain how accelerating power is calculated at point of discontinuity on swing curve?

g) How traveling waves are characterized? Explain the voltage distribution with wave shape diagram and derive the wave equation.

h) Explain the effect of cable on surge. A surge of 100kV travel along an overhead line towards its junction with a cable. The surge impedances for overhead line and cable are 400 ohms and 50 ohms respectively. Find the magnitude of surge transmitted on the cable.

SECTION-C

Attempt any two of the following: **(15×2=30)**

3. (a) What do you understand by single line diagram and reactance diagram? Explain per unit system and list its advantages.

(b) A balance star connected load takes 150 A from a balance three phase 4 wire supply. If the fuse from two of the line is removed, then find the symmetrical components of the line currents before and the after the fuses are removed.

4. (a) Show that transient current may rise to twice of maximum current ($2I_{max}$) in transmission line with help of transients in *R-L* circuit.

(b) Form the bus admittance matrix (Y_{bus}**)** for a four bus interconnected power sytem whose data is given as below.

Bus Code	**Admittance**
1-2	2- j0.8
1-3	1- j4
2-3	0.666 – j2.664
2-4	1- j0.4
3-4	2- j0.8

5. (a) What are simplifying assumptions taken while for stability studies of a power system?

(b) Explain equal area criterion.

(c) Discuss the various measures adapted for protection of power system equipments from traveling wave surges