13/11/13

Roll No.: | | | | | | | | |

B.E. / B.Tech. (Full Time) DEGREE EXAMINATIONS, Dec 2013

ELECTRICAL & ELECTRONICS ENGINEERING BRANCH

FIFTH SEMESTER

EE9302- POWER SYSTEM ANALYSIS
(REGULATIONS 2008)

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

Answer ALL Questions

PART-A (10 X 2 = 20 Marks)

1. What are the advantages of pu representation?
2. Draw the single line diagram showing the essential parts in the power system network.
3. Explain why one of the bus in the system is taken as slack bus in the load flow studies.
4. Compare Gauss-Seidel and N-R method.
5. What are the assumptions made in short circuit analysis?
6. What are power balance equations in power flow analysis?
7. Name the fault in which the negative and zero sequence currents are equal to zero.
8. Draw the equivalent sequence network for a L-L bolted fault in power system.
9. Define voltage stability and voltage collapse.
10. Define the term “transient stability”.

PART-B (5x16 = 80 marks)

11(i) The data for the system whose single-line-diagram is shown in Fig. 11a is as follows:

G1: 20 MVA, 13.8 kV, X” = 20%;
G2: 30 MVA, 18 kV, X” = 20 %
G3: 30 MVA, 20 kV, X” = 20%
T1: 25 MVA, 220/13.8 kV, X=10%
T2: 3 single phase units each rated at 10MVA,127/18 kV,X=10%
T3: 35 MVA, 220/22 kV, X=10%

Choose the base power as 50 MVA, base kV as 13.8 kV on the generator G1. Draw the reactance diagram. Indicate pu reactances on the diagram. (16)

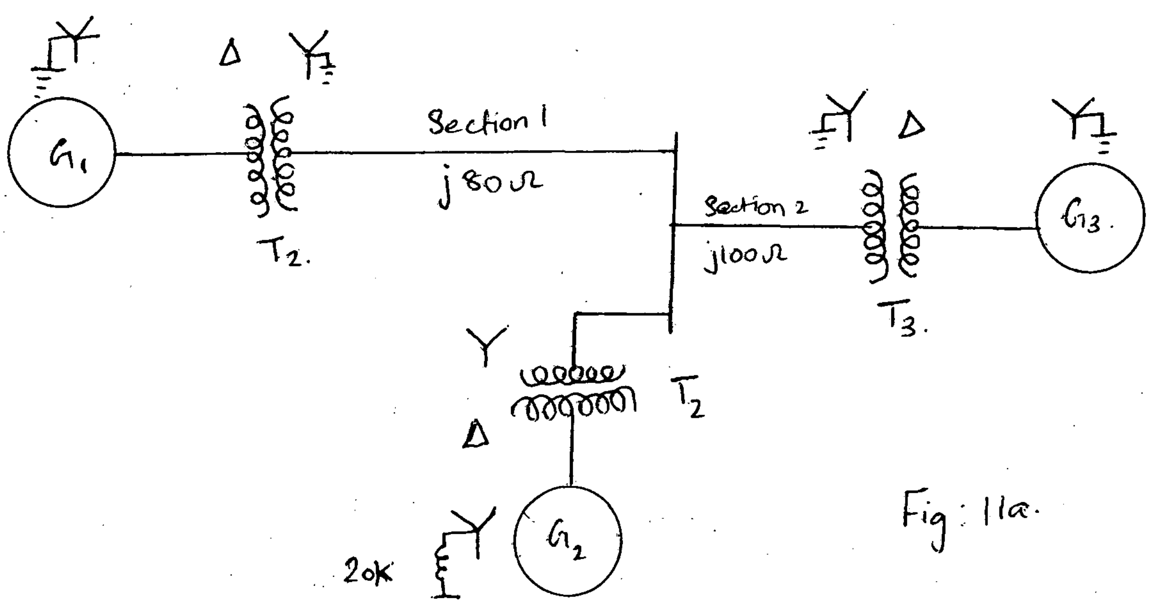
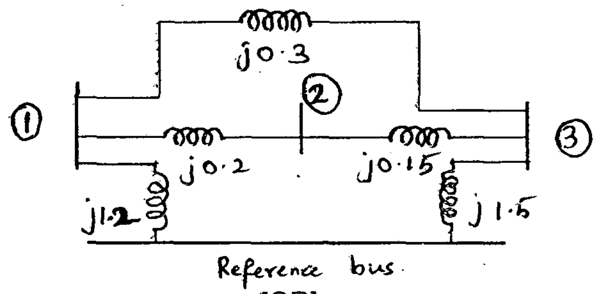


Fig: 11a.

12(a) Determine the Z_{bus} for the system whose reactance diagram shown in Fig 12a. Impedance is given in per unit. (16)



[OR]

12 (b) Eliminate buses 3 and 4 in the given bus admittance matrix and form a new Bus admittance matrix. (16)

$$Y_{Bus} = \begin{bmatrix} -j9.8 & 0.0 & j4.0 & j5.0 \\ 0.0 & -j8.3 & j2.5 & j5.0 \\ j4.0 & j2.5 & -j14 & j8.0 \\ j5.0 & j5.0 & j8.0 & -j18.0 \end{bmatrix}$$

13 (a). Derive the power flow problem. Explain the step-by-step computational procedure to solve the power flow problem using the Gauss-Seidel method. (16)

[OR]

13 b. Fig. 13b shows the one-line diagram of a simple three-bus power system with generators at buses 1 and 3. The line impedances are marked in per unit on a 100 MVA base. Find out the bus voltages after two iterations using Newton-Raphson method. (16)

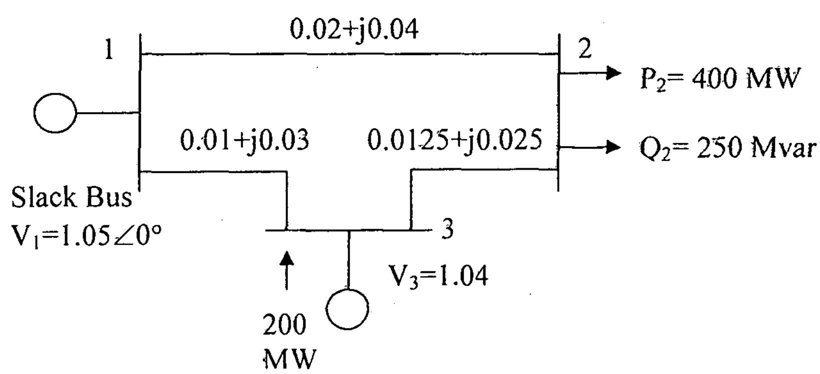


Fig. 13b

14.a. A 30 MVA, 11 kV generator has $Z_1 = Z_2 = j0.2$ pu, $Z_0 = j0.05$ pu. A line to ground fault occurs on the generator terminals. Find the fault current and line voltages during fault conditions. Assume that the generators neutral is solidly grounded and that the generator is operating at no load and at rated voltage at the occurrence of fault. (16)

[OR]

14.b. Derive the relationship for fault currents in terms of symmetrical components when there is a double line-to-ground (DLG) fault. Also draw a diagram showing interconnection of sequence networks for DLG fault. (16)

15 a. Fig15a shows transmission network. The pu reactances of the equipments are as shown. The voltage behind transient reactance of generator is 1.1 pu. The infinite bus voltage is 1+j0 p.u. The system is transmitting 1 pu power when fault occurs at the middle of the line. Determine (i) transfer reactance for prefault, during fault and post fault condition (ii) critical clearing angle. (16)

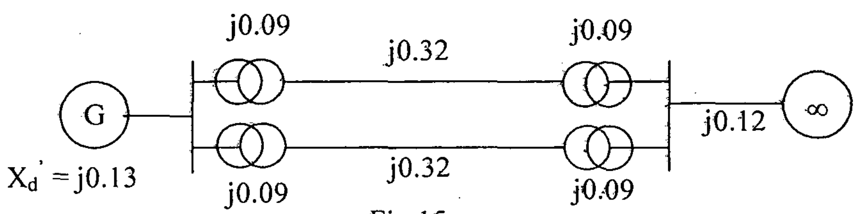


Fig 15a

[OR]

15.b Starting from first principles, derive the swing equation of a synchronous machine. (16)