Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 31216

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Sixth Semester

Electrical and Electronics Engineering

080280055 — POWER SYSTEM ANALYSIS AND STABILITY

(Common to 080280049 – Power System Analysis and stability for B.E. (Part-time) Fifth Semester Electrical and Electronics Engineering)

(Regulation 2008)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate steady state and transient state stability.
2. List any two advantages of per unit analysis.
3. Define primitive network.
4. Draw π equivalent circuit of transformer with off nominal tap ratio.
5. What is the need for slack bus in a power system?
6. Mention any two advantages of fast decoupled load flow method.
7. Write any four approximations made in short circuit studies.
8. What is meant by symmetrical components?
9. State any two merits of equal area criterion.
10. Write any four methods of improving steady state stability limit.

PART B — (5 × 16 = 80 marks)

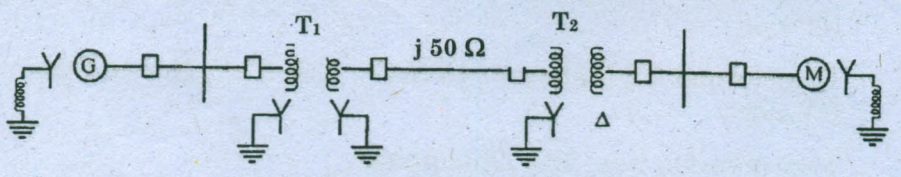
11. (a) Write short notes on

(i) Need for system analysis in planning and operation of power system. (8)

(ii) Load flow analysis. (8)

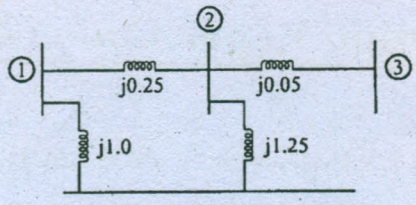
Or

(b) Draw the reactance diagram using base of 100 MVA, 220 kV in 50 Ω line.



Generator: 40 MVA, 25 kV, X" = 20%
Synchronous motor: 50 MVA, 11 kV, X" = 23%
Star-Star transformer: 40 MVA, 33/220 kV, X = 10%
Star-delta transformer: 30 MVA, 11/220 kV, X = 10%. (16)

12. (a) (i) Find the bus impedance matrix for the system whose reactance diagram is shown in fig. All the impedances are in p.u. (8)



Reference bus

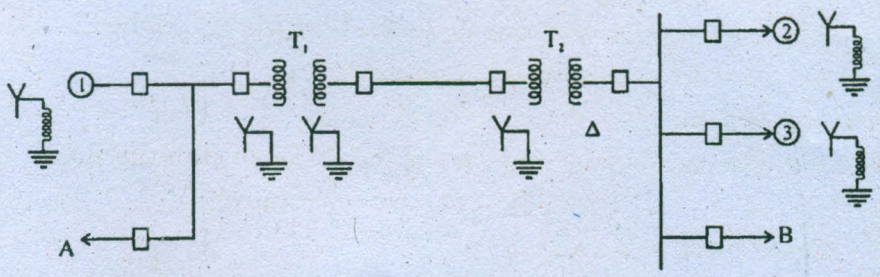
Fig. 12 (a) (i)

(ii) Draw the network and find bus admittance matrix. (8)

Bus Code	Line Impedance p.u.	Line Charging Admittance p.u
1-2	0.2+j0.8	j0.02
2-3	0.3+j0.9	j0.03
2-4	0.25+j 1	j0.04
3-4	0.2+j0.8	j0.02
1-3	0.1 +j0.4	j0.01

Or

(b) Obtain the p.u. impedance diagram of the power system shown below: (16)



Generator No.1: 30 MVA, 10.5 kV, X" = 1.6 Ohm

Generator No.2: 15 MVA, 6.6 kV, X" = 1.2 Ohm

Generator No.3: 25 MVA, 6.6 kV, X" = 0.56 Ohm

Transformer T1 (3phase) : 15 MVA, 33/11 kV, X = 15.2 Ohm per phase on HT side

Transformer T2 (3phase) : 15 MVA, 33/6.8 kV, X = 16 Ohm per phase on HT side

Transmission line: 20.5 Ohm/phase

Load A : 15 MW, 11 kV, 0.9 p.f. lagging

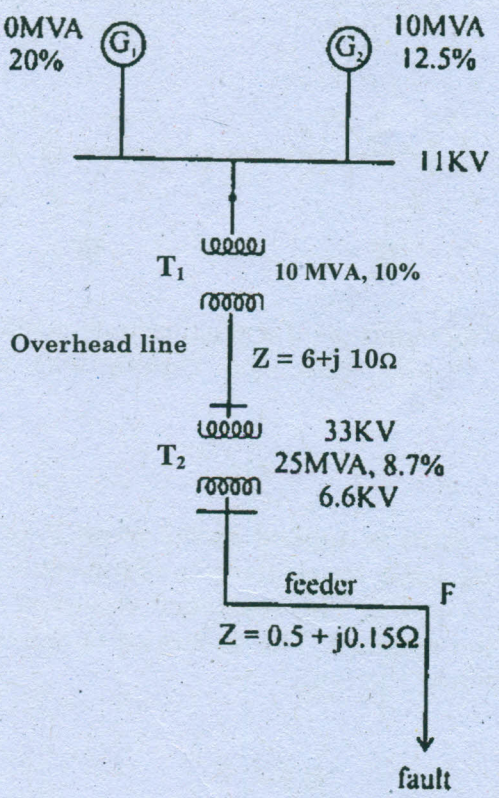
Load B : 40 MW, 6.6 kV, 0.85 p.f lagging

13. (a) Derive load flow algorithm using Gauss - Seidel method with flow chart and discuss the advantages of the method. (16)

Or

(b) Derive load flow algorithm using Newton-Raphson method with flow chart and state the importance of the method. (16)

14. (a) (i) For the radial network shown below a three phase fault occurs at point F. Determine the fault current and the line voltage at 11 kV bus under fault conditions. (8)

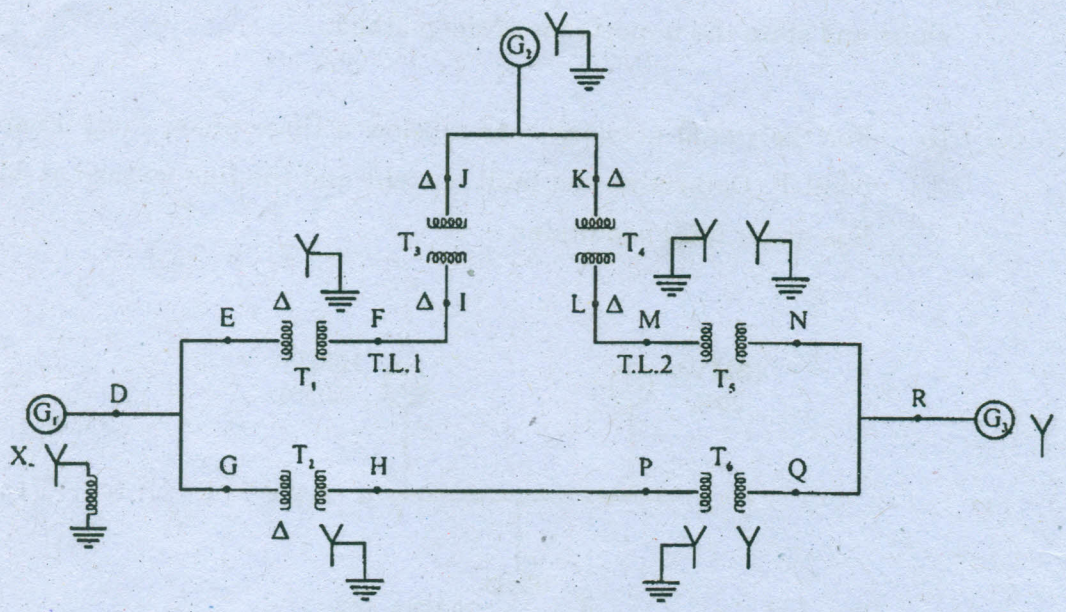


(ii) Obtain the symmetrical components of a set of unbalanced currents $I_a = 1.6 < 25°, I_b = 1.0 < 180°, I_c = 0.9 < 132°$. (8)

Or

(b) (i) Derive the expression for fault current in double line to ground fault on unloaded generator. Draw an equivalent network showing the inter connection of networks. (10)

(ii) Draw the zero sequence diagram from the system whose one - line diagram is shown below. (6)



15. (a) Derive the swing equation of a synchronous machine swinging against an infinite bus. Clearly state the assumptions in deducing the swing equation. (16)

Or

(b) A three phase fault is applied at the point P as shown in Fig. Find the critical clearing angle for clearing the fault with simultaneous opening of the breakers 1 and 2. The reactance values of various components are indicated in the diagram. The generator is delivering 1 p.u power at the instant proceeding the fault. (16)