

C 3224

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Sixth Semester

(Regulation 2004)

Electrical and Electronics Engineering

EE 1352 — POWER SYSTEM ANALYSIS

(Common to B.E. (Part-Time) Fifth Semester Regulation – 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the need for system analysis in planning and operation of power system?
2. How is generator in transient analysis represented?
3. What are the advantages of per unit system?
4. Write the symmetrical components of three phase system.
5. What is P-Q bus in power flow analysis?
6. What do you mean by flat voltage start?
7. What is the reason for transients during short circuits?
8. Draw the equivalent sequence network for a Line-Line bolted fault in a power system.
9. What is power system stability?
10. State equal area criterion.

PART B — (5 × 16 = 80 marks)

11. (a) Draw the reactance diagram for the power system shown in Fig. 11(a). Neglect resistance and use a base of 100 MVA, 220 kV in 50 Ω line. The ratings of the generator, motor and transformer are given below. (16)

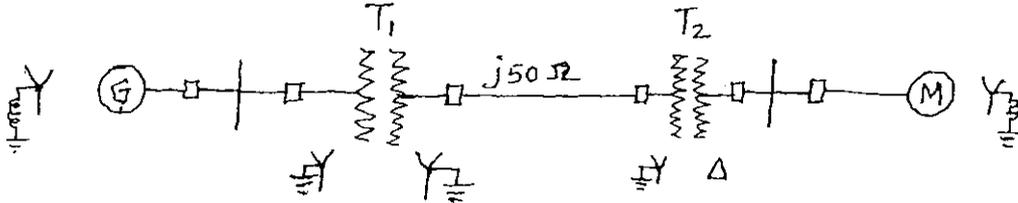


Fig. 11 (a)

Generator : 40 MVA, 25 kV, $X'' = 20\%$

Synchronous motor : 50 MVA, 11 kV, $X'' = 30\%$

Y - Y Transformer : 40 MVA, 33/220 kV, $X = 15\%$

Y - Δ Transformer : 30 MVA, 11/220 kV (Δ/Y), $X = 15\%$.

Or

- (b) Draw the structure of an electrical power system and describe the components of the system with typical values. (16)
12. (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)
13. (a) A generator is connected through a transformer to a synchronous motor. The subtransient reactances of generator and motor are 0.15 p.u. and 0.35 p.u. respectively. The leakage reactance of the transformer is 0.1 p.u. All the reactances are calculated on a common base. A three phase fault occurs at the terminals of the motor when the terminal voltage of the generator is 0.9 p.u. The output current of generator is 1 p.u. and 0.8 p.f. leading. Find the subtransient current in p.u. in the fault, generator and motor. Use the terminal voltage of generator as reference vector. (16)

Or

- (b) Derive the expression for fault current in Line-to-Line fault on an unloaded generator in terms of symmetrical components. (16)

14. (a) Explain the step by step procedure for systematic fault analysis using bus impedance matrix. (16)

Or

- (b) Determine the fault current and MVA at faulted bus for a line to ground (solid) fault at bus 4 as shown in Fig. 14 (b). (16)

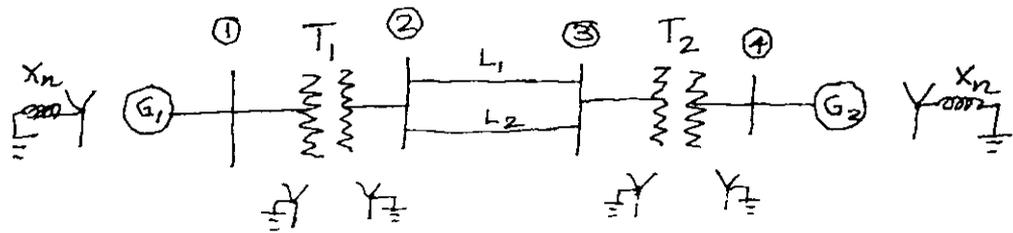


Fig. 14 (b)

G_1, G_2 : 100 MVA, 11 kV, $X^+ = X^- = 15\%$, $X^0 = 5\%$, $X_n = 6\%$

T_1, T_2 : 100 MVA, 11 kV/220 kV, $X_{leak} = 9\%$

L_1, L_2 : $X^+ = X^- = 10\%$, $X^0 = 10\%$ on a base of 100 MVA. Consider a fault at phase 'a'.

15. (a) Derive Swing equation used for stability studies in power system. (16)

Or

- (b) Explain the modified Euler method of analysing multimachine power system for stability, with neat flow chart. (16)