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Question Paper Code : 52956

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY, 2019.

Fifth Semester

Electrical and Electronics Engineering

EE 6501 — POWER SYSTEM ANALYSIS

(Regulation 2013)

(Common to PTEE 6501 — Power System Analysis for B.E. (Part-Time) for Fifth Semester — Electrical and Electronics Engineering — Regulation 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is meant by base quantities in per unit representation?

2. What is impedance diagram and what are the approximations made in this diagram?

3. What are the information that are obtained from a load flow study?

4. What is swing bus?

5. Write the ways of adding an impedance to an existing system so as to modify bus impedance matrix.

6. What is meant by fault level?

7. Name the faults which are having all three equal sequence current and which do not have zero sequence current.

8. Draw the zero sequence impedance equivalent circuit for $\Delta - \Delta$ type Three-Phase Transformers.

9. Define infinite bus in a power system.

10. Define critical clearing angle.

PART B — (5 × 13 = 65 marks)

11. (a) The one line diagram of three phase power system is shown in Fig. 11(a). Select a common base of 100 MVA and 22 kV on generator side draw the impedance diagram in per – unit

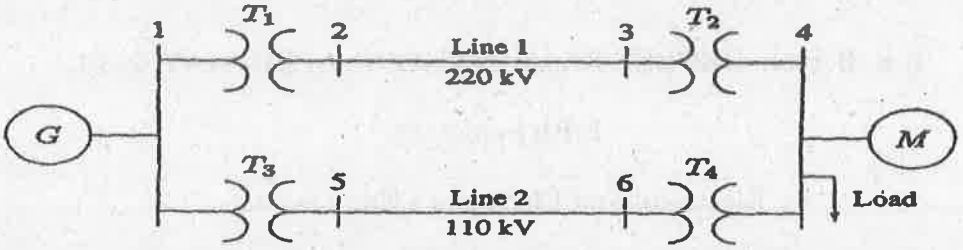

Fig. 11 (a)

G : 90 MVA , 22 KV , X = 18% ; T1 : 50 MVA , 22/220 KV , X = 10%

T2 : 40 MVA , 22/220 KV , X = 6% ; T3 : 40 MVA , 220/110 KV , X = 6.4%

T4 : 40 MVA , 110/11 KV , X = 8% ; M : 66.5 MVA , 10.45 KV , X = 18.5%

The three phase load at bus 4 absorbs 57 MVA, 0.6 power factor lagging at 10.45 kV. Line 1 and line 2 have reactance of 48.4 Ω and 65.43 Ω respectively. (13)

Or

(b) From the impedance diagram shown in Fig.11(b). Compute the bus admittance matrix and draw the admittance diagram. (13)

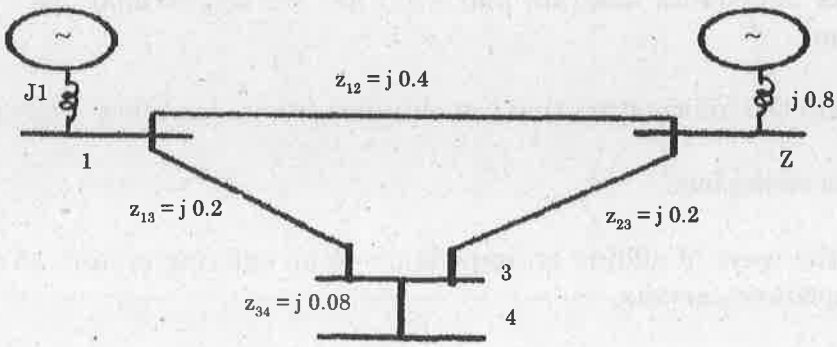

Fig.11(b)

12. (a) With neat flowchart, explain the computational procedure for load flow solution using Gauss-Seidal iterative method. (13)

Or

(b) Evaluate the Jacobian elements for the 3-Bus system shown in Fig. 12(b). All the impedances in this Fig. 12(b) are mentioned in per unit.

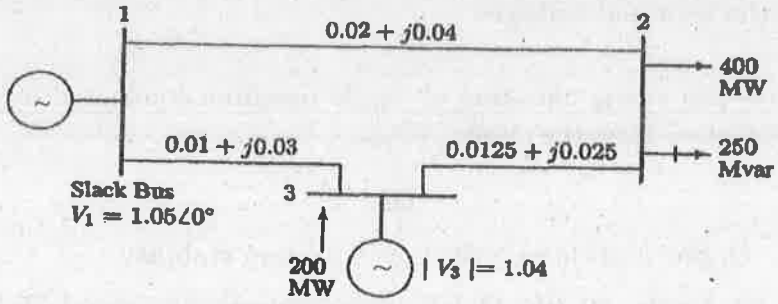

Fig. 12(b)

13. (a) A 25 MVA, 11 kV generator with Xd'' = 20% is connected through a transformer, line and a transformer to a bus that supplies three identical motors as shown in Fig.13(a). Each motor has Xd'' = 20% and Xd' = 30% on a base of 5 MVA, 6.6 kV. The three-phase rating of the step-up transformer is 25 MVA, 11/66 kV with a leakage reactance of 10% and that of the step-down transformer is 25 MVA, 66/6.6kV with a leakage reactance of 10%.The bus voltage at the motors is 6.6 kV when a three-phase fault occurs at the point F. For the specified fault, calculate (i) the sub transient current in the fault, (ii) the sub transient current in the breaker B. (iii) the momentary current in breaker B, and (iv) the current to be interrupted by breaker B in five cycles. (13)

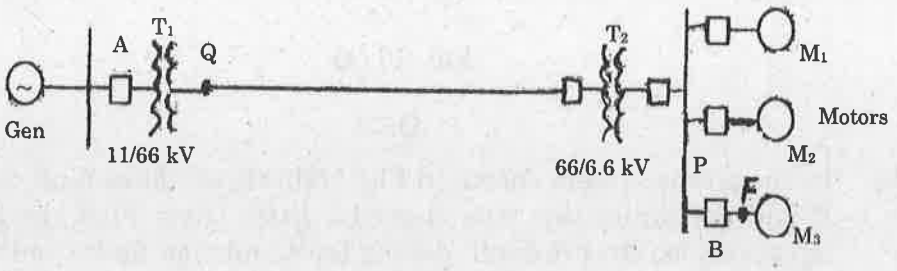

Fig. 13(a)

Or

(b) (i) Write a short notes on fault current in synchronous machine. (8)

(ii) What are the assumptions made in fault analysis? (5)

14. (a) Derive the expression for fault current in double line to ground fault on unloaded generator. Draw the equivalent network showing the interconnection of networks to simulate double line to ground fault. (13)

Or

(b) The reactances of an alternator rated 10 MVA, 6.9 kV are $X_1 = X_2 = 15$ % and $X_{g0} = 5$ %. The neutral of the alternator is grounded through a reactance of 0.38 Ω. Single Line to ground (SLG) fault occurs at the terminals of the alternator. Determine the line currents, fault current and the terminal voltages. (13)

15. (a) Derive the swing equation of single machine connected to a infinite bus system and draw the swing curve. (13)

Or

(b) (i) Define and classify the power system stability (8)

(ii) A 4-pole, 50 Hz, 11 KV turbo generator is rated 75 MW and 0.86 power factor lagging. The machine rotor has a moment of intertia of 9000 Kg-m^2. Find the inertia constant in MJ / MVA and M constant or momentum in MJs/elec degree. (5)

PART C — (1 × 15 = 15 marks)

16. (a) Construct Z Bus using bus building algorithm : (15)

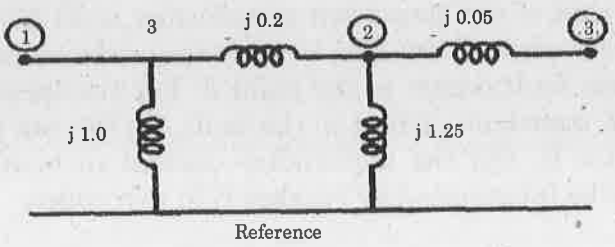

Fig. 16 (a)

Or

(b) In the power system shown in Fig. 16(b) three phase fault occurs at point P and the faulty line was opened a little later. Find the power output equations for the pre-fault, during fault and post-fault conditions.

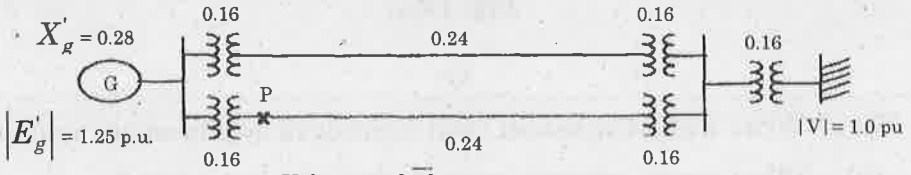

Fig. 16(b)