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Question Paper Code : 80377

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electrical and Electronics Engineering

EE 6501 — POWER SYSTEM ANALYSIS

(Regulations 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — ($10 \times 2 = 20$ marks)

1. State the advantage of per unit analysis.

2. How are the loads represented in the reactance and Impedance diagram?

3. What is Jacobian matrix?

4. Write the need for Slack bus in load flow analysis.

5. What is the need for short circuit study?

6. How the shunt and series faults are classified?

7. Define short circuit capacity.

8. Why the neutral grounding impedance Zn appears as 3Zn in zero sequence equivalent circuit?

9. Define Voltage Stability.

10. State few techniques to improve the stability of the power system.

PART B — (5 × 16 = 80 marks)

11. (a) Prepare a per phase schematic of the system shown in Fig. 11(a) and show all the impedance in per unit on a 100 MVA, 132 kV base in the transmission line circuit. The necessary data are given as follows: (16)

G1 : 50MVA, 12.2kV, X = 0.15p.u

G2 : 20MVA, 13.8kV, X = 0.15 p.u

T1 : 80MVA, 12.2/161kV, X = 0.1 p.u

T2 : 40MVA, 13.8/161kV, X = 0.1 p.u

Load : 50MVA, 0.8 pf lag operating at 154 kV

Determine the p.u impedance of the load.

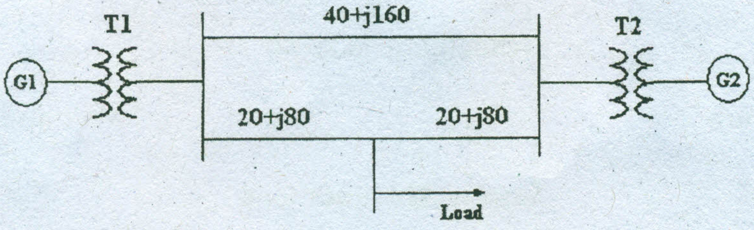

Fig. 11(a)

Or

(b) The parameters of a 4-bus system are as under :

Line starting bus	Line ending bus	Line impedance	Line charging admittance
1	2	0.2+j0.8	j0.02
2	3	0.3+j0.9	j0.03
2	4	0.25+j1.0	j0.04
3	4	0.2+j0.8	j0.02
1	3	0.1+j0.4	j0.01

Draw the network and find bus admittance matrix. (16)

12. (a) With a neat flow chart, explain the computational procedure for load flow solution using Newton Raphson iterative method when the system contains all types of buses. (16)

Or

(b) The Fig. 12(b) shows the one line diagram of a simple 3 bus power system with generators at buses 1 and 3.Line impedances are marked in p.u on a 100 MVA base. Determine the bus voltages at the end of second iteration using Gauss – Seidel method. (16)

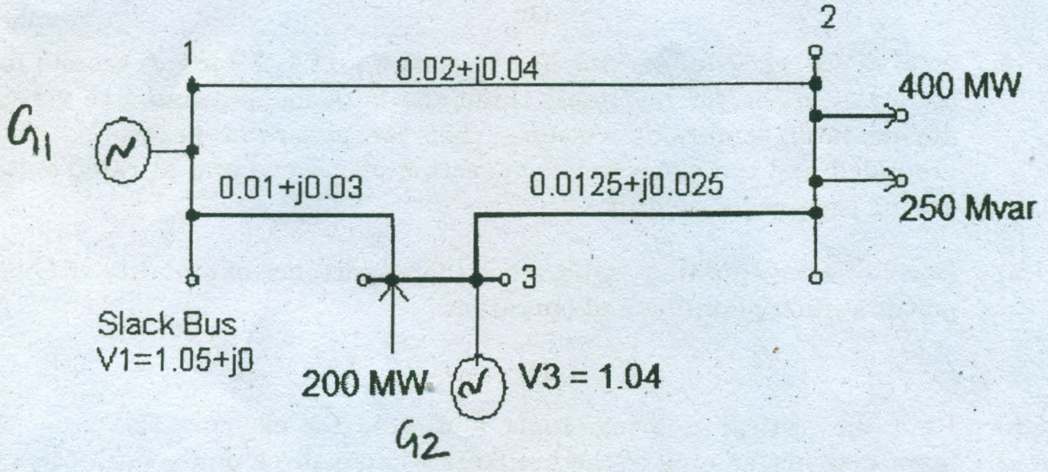

Fig. 12(b)

13. (a) For the radial network shown in Fig. 13(a) 3Φ fault occurs at point F. Determine the fault current and the line voltage at 11.8 kV bus under fault condition.

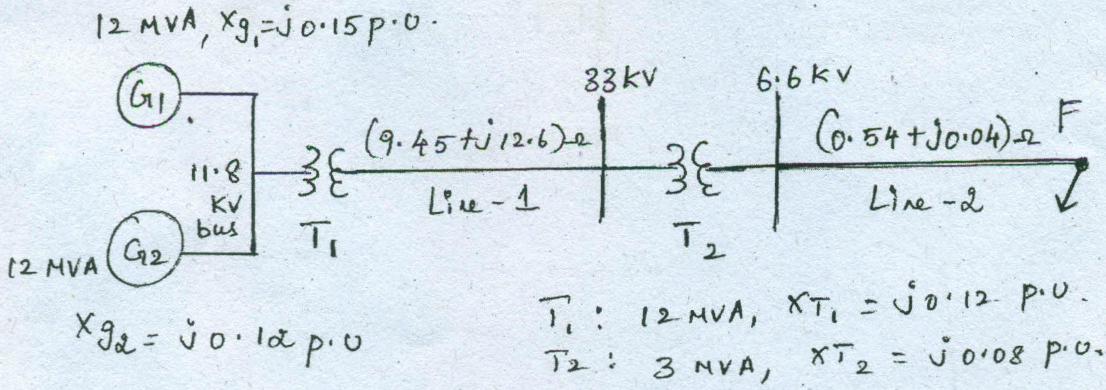

Fig. 13(a)

Or

(b) A 3 phase, 5 MVA, 6.6 kV alternator with a reactance of 8% is connected to a feeder series impedance (0.12 + j0.48) ohm/phase/km through a step up transformer. The transformer is rated at 3 MVA, 6.6 kV/33 kV and has a reactance of 5%. Determine the fault current supplied by the generator operating under no load with a voltage of 6.9 kV, when a 3 phase symmetrical fault occurs at a point 15 km along the feeder. (16)

14. (a) Derive the expression for fault current in line to line fault on unloaded generator. Draw an equivalent network showing the interconnection of networks to simulate line to line fault. (16)

Or

(b) A 30 MVA, 11 kV generator has z1 = z2 = j 0.05. A Line to ground fault occurs at generator terminals. Find the fault current and line voltages during fault conditions. Assume that the generator neutral is solidly grounded and the generator is operating at no load and at rated voltage during occurrence of fault. (16)

15. (a) Derive Swing equation and discuss the importance of stability studies in power system planning and operation. (16)

Or

(b) Find the critical clearing angle and time for clearing the fault with simultaneous opening of the breakers when a three phase fault occurs at point P close to bus 1 as shown in Fig. 15(b). The generator is delivering 1.0 pu. power at the instant preceding the fault.

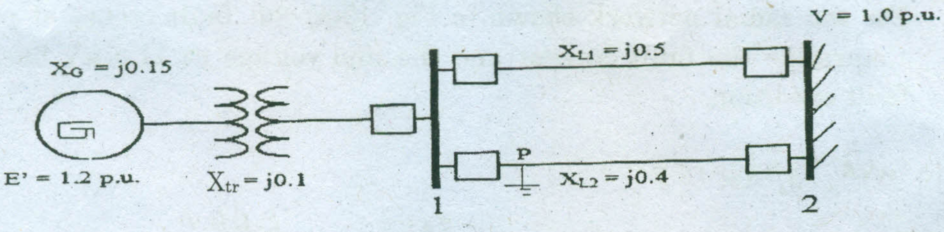

Fig. 15(b)