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Question Paper Code : 51219

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

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. Write the equation for converting the pu. impedance expressed in one base to another.

2. The base kV and base MVA of a 3 phase transmission line is 33kv and 10MVA respectively. Calculate the base current and base impedance.

3. Define primitive network.

4. What is off-nominal tap ratio of transformer?

5. What is meant by flat voltage start?

6. How is the transmission loss calculated in power flow analysis?

7. What is the reason for transients during short circuits?

8. Define positive sequence impedance,

9. State equal area criterion.

10. What is the use of swing curve?

PART B — (5 × 16 = 80 marks)

11. (a) Draw the pu impedance diagram for the power system shown in figure 11(a). Neglect resistance, and use a base of 100MVA, 220kv in 50Ω line. The ratings 16 of the generator, motor and transformers are Generator 40MVA, 25kV X" = 20%

Motor 50 MVA, 11 kV, x'' = 30%

Y-Y transformer, 40MVA, 33 Y-220 —Y kV, X=15%

Y-Δ transformer, 30MVA, 11 Δ-220 Y kV X=15% (16)

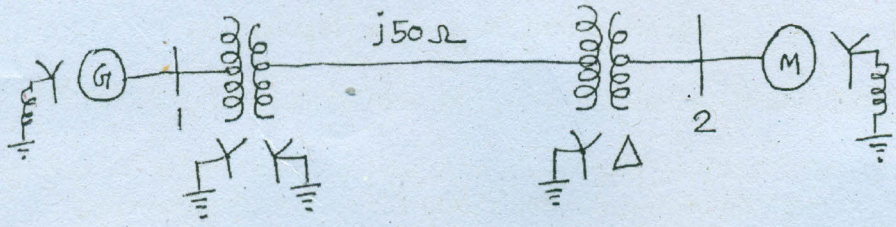

Figure 11(a)

Or

(b) (i) Explain the need for system analysis in planning and operation of power system. (10)

(ii) Discuss the significance of per unit representation. (6)

12. (a) For the 3-bus network shown in figure 12(a) build Z_{bus} . (16)

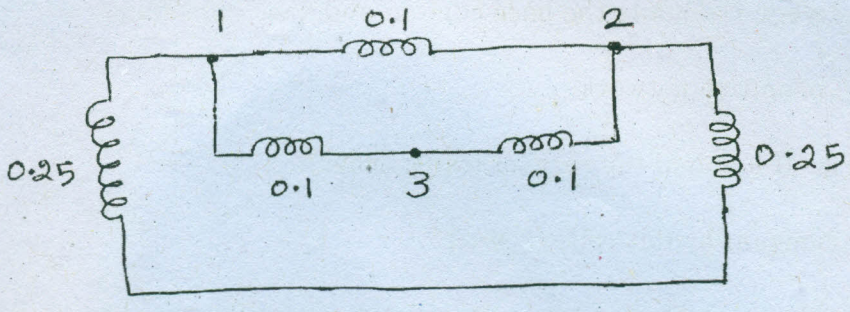

Figure 12(a)

Or

(b) (i) Explain the Z_{bus} building algorithm. (10)

(ii) Discuss the modeling of generator for power system analysis. (6)

13. (a) For the sample system of figure 13(a) the generators are connected at all the four buses, while loads are at buses 2 and 3. Values of real and reactive powers are listed in table 13(a). All buses other than the slack are PQ type. Assuming a flat voltage start, find the voltages and bus angles at the 3 buses at the end of the first GS iteration. (16)

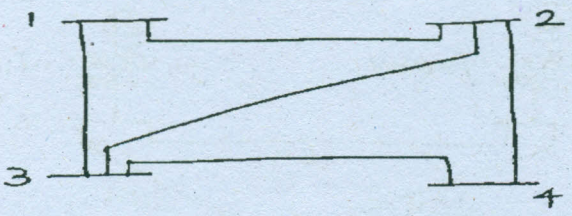

Fig 13(a)

Line bus to bus	R,PU	X,PU
1-2	0.05	0.15
1-3	0.1	0.3
2-3	0.15	0.45
2-4	0.1	0.3
3-4	0.05	0.15

Bus	P_i, pu	Q_i, pu	V_i, pu	Remarks
1	-	-	$1.04\angle 0°$	Slack bus
2	0.5	–0.2	-	PQ Bus
3	–1.0	0.5	-	PQ Bus
4	0.3	–0.1	-	PQ Bus

Table 13(a)

Or

(b) Discuss the Newton Raphson method in detail for the power flow analysis. (16)

14. (a) Consider the three bus system of figure 14(a). The generators are 100MVA, with transient reactance 10% each. Both the transformers are 100MVA with a leakage reactance of 5%. The reactance of each of the lines to a base of 100MVA. 110kV is 10%. obtain the short circuit solution for a 3 phase solid short circuit on bus 3.

Assume prefault voltages to be 1 pu and prefault currents to be zero. (16)

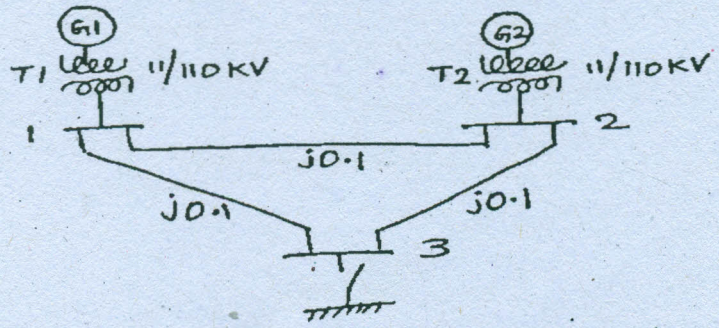

Figure 14(a)

Or

(b) Define the relationship for fault current in terms of symmetrical components when there is a line-to-line fault between phase b and c. (16)

15. (a) Discuss equal area criterion of a single machine tied to infinite bus bar for a sudden change in mechanical input. (16)

Or

(b) (i) Derive the swing equation. (8)

(ii) A synchronous generator of reactance 1.20 pu is connected to an infinite bus bar ($|v| = 1.0 pu$) through transformers and a line of total reactance of 0.60 pu. The generator no load voltage is 1.20 pu and its inertia constant is H = 4MW – s/MVA. The resistance and machine damping may be assumed negligible. The system frequency is 50 Hz.

Calculate the frequency of natural oscillations if the generator is loaded to

(1) 50% and

(2) 80% of its maximum power limit. (8)