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

Question Paper Code : 31238

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2013.

3rd - FN

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. Define modern power system.

2. What is single line diagram?

3. Write the equation for per unit impedance if change of base occurs.

4. What are the methods available for forming bus admittance matrix?

5. Discuss the effect of acceleration factor in load flow study.

6. Why do we go for iterative methods to solve load flow problems?

7. Write the relative frequency of occurrence of various types of faults.

8. What is sub transient reactance?

9. State the causes of voltage instability.

10. Write the expression for maximum power transfer.

PART B — (5 × 16 = 80 marks)

11. (a) Draw the per unit reactance diagram for the power system shown in fig. Q 11(a). Neglect resistance and use a base of 100MVA, 220KV in 50 ohms line. The ratings of the generator, motor and transformers are

G: 50MVA, 25KV, X" = 20%; M: 40MVA, 11KV, X" = 30%

T_1: 50MVA, 33 Y/ 200Y KV, X = 15%; T_2: 30MVA, 11 Δ/220Y KV, X = 15%

Load: 11 KV, 50MW+j68 MVAR

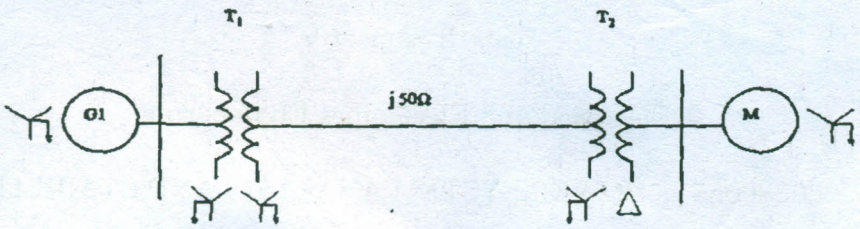

Fig. Q 11(a)

Or

(b) A 120MVA, 19.5kv generator has x_s =1.5 p.u. and is connected to a transmission line by a transformer rated 150MVA, 230kV Y/Y with x = 0.1 p.u. If the base to be used in the calculation is 100MVA, 230kV for the transmission line, find per unit values to be used for the transformer and generator reactances.

12. (a) Using the graph theory concepts, explain the following matrices.

(i) Element node incidence matrix $\hat{A}$ (8)

(ii) Bus incidence matrix A (8)

Or

(b) Determine Y bus matrix of the sample power system shown in fig. Q 12(b).

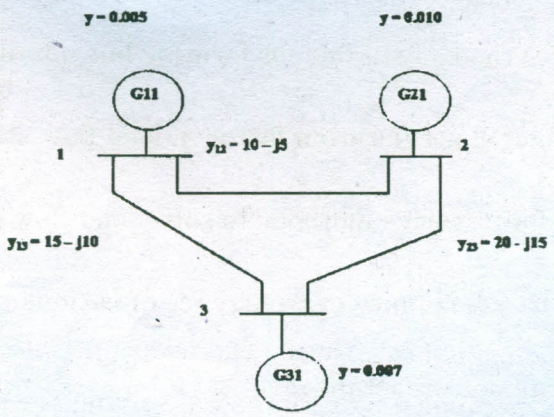

Fig. Q 12(b)

13. (a) The system data for a load flow solution are given in tables. Determine the voltages at the end of first iteration by Gauss-seidal method. Take $\alpha = 1.6$.

Bus code	P(p.u)	Q(p.u)	V(p.u)	Remarks
1	--	--	1.05	Slack bus
2	0.5	0.2	--	PQ bus
3	1.0	0.5	--	PQ bus
4	0.3	0.1	---	PQ bus

Lines	R in p.u	X in p.u
1-2	0.05	0.15
1-3	0.10	0.30
1-4	0.20	0.40
2-4	0.10	0.30
3-4	0.05	0.15

Or

(b) Draw the flowchart to describe load flow procedure using Newton-Raphson method.

14. (a) Derive the necessary formulae for analysis of a power system subjected to unsymmetrical short circuits. Give step by step procedure for applying these formulae.

Or

(b) Two 10,000 KVA, 11kv alternators are connected to a common bus bar. Each of the alternators has a positive, negative and zero sequence of 1.0, 0.75 and 0.3 pu. If a line to ground fault occurs on the bus bars, determine the fault current if

(i) Both the alternator neutrals are solidly grounded. (8)

(ii) One of the alternator neutrals is solidly grounded while the other is isolated. (8)

15. (a) A 50Hz synchronous generator capable of supplying 400MW of power is connected to a larger power system and is delivering 80MW when a three phase fault occurs at its terminals, determine

(i) The time in which the fault must be cleared if the maximum power angle is to be -85° assume H=7MJ/MVA on a 100MVA base. (8)

(ii) The critical clearing angle. (8)

Or

(b) Discuss the following:

(i) Various factors affecting the transient stability of the system. (8)

(ii) The modified Euler method of solving the swing equation, with the help of a neat flowchart. (8)
