Roll No. | | | | | | | | | | | | |

Total No. of Pages : 03

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B.Tech.(EE/Electrical & Electronics) (2011 Onwards) (Sem.7,8)

POWER SYSTEM ANALYSIS

Subject Code : BTEE-801

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt ANY FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt ANY TWO questions.**

SECTION-A

1. Write briefly :

a. What are the different types of buses in a power system?

b. What are the symmetrical components of a three-phase system?

c. Define transient stability of a power system.

d. State the causes of voltage instability.

e. State the advantage of per unit analysis.

f. How are the loads represented in the reactance and impedance diagram?

g. State equal area criterion.

h. What is the purpose of using single line diagram?

i. Define the primitive matrix.

j. Write the need for load-flow study.

SECTION-B

2. Compare Gauss-Seidel and Newton-Raphson methods of load flow solutions.

3. Derive the expressions of critical clearing time and critical clearing angle.

4. Explain how a symmetrical fault can be analyzed using Z_{BUS}.

5. Draw the per unit reactance diagram for the power systems shown in Fig. 1. Neglect resistance and use a base of 100 MVA, 220 kV in 50Ω line. The ratings of the generator, motor and transformers are

   G1: 40 MVA, 25 kV, X" = 20% T1: 40 MVA, 33/220 kV (Y-Y), X = 15%

   M: 50 MVA, 11 kV, X" = 30% T2: 30 MVA, 11/220 kV (Δ-Y), X = 15%

   Load: 11 kV, 50 MW+j68 MVAr

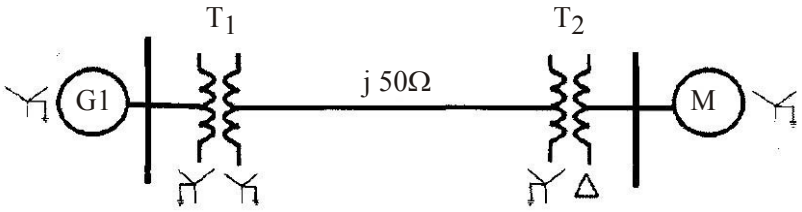

Fig. 1

6. Discuss the various factors affecting the transient stability of the system.

SECTION-C

7. Develop any two modifications of Z-bus building algorithm for the formulation of a large power system.

8. A synchronous generator and motor are rated for 30,000 kVA, 13.2 kV and both have subtransient reactance of 20%. The line connecting them has a reactance of 10% on the base of machine ratings. The motor is drawing 20,000 kW at 0.8 pf leading. The terminal voltage of the motor is 12.8 kV. When a symmetrical three-phase fault occurs at motor terminals, find the subtransient current in generator and at the fault point.

9. Consider 3-bus system. Each of the three lines has a series impedance of 0.04+j0.12 p.u. and a total shunt admittance of j0.05 p.u. The specified quantities at the buses are tabulated below.

Bus	Real load demand (P_D)	Reactive load demand (Q_D)	Real power generation (P_G)	Reactive power generation (Q_G)	Voltage specification
1	2.5	1.5	Unspecified	Unspecified	V_1=1.04+j0.0 (Slack bus)
2	0.0	0.0	1.0	1.5	Unspecified (PG bus)
3	2.0	1.1	0.0	Q_{G3} = ?	V_3 = 1.04 (PV bus)

The available controllable reactive power sources with the constraint at bus 3 is

$$0 \le Q_{G3} \le 1.5 \text{ p.u.}$$

Find the load flow solution including power mismatch vectors, slack powers and line flows using Newton-Raphson method upto first iteration.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.