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

Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(Power System) (2013 & Onwards) (Sem.–2)

POWER SYSTEM DYNAMICS AND STABILITY

Subject Code : MTPS-203

Paper ID : [A2515]

Time : 3 Hrs. Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**
3. **Assume any missing data appropriately.**

1. a) State and explain angular and transient stability of power system. (10)

   b) What is significance of steady state stability and how this determined? (10)

2. a) Draw and explain generator capability curve, label the diagram indicating various limitations on generation of active and reactive power, and stability limits. (10)

   b) Explain dynamic modeling of Induction motors using d-q axis transformation. (10)

3. a) Explain first swing stability of generators. Draw Power-angle curve and explain equal area criterion. (10)

   b) A generator is delivering 1.0 pu power to an infinite bus through a network having negligible resistance, at 50Hz. A fault occurs which reduces the maximum power transferable to 0.4 pu, whereas before the fault this power was 1.8 pu and after the clearance of fault it is 1.3 pu., using the equal area criterion, determine the critical clearing angle. (10)

4. a) Explain the term "*small signal stability*" as applied to power system. (5)

   b) In a SMIB system having $R_e = 0$, $X_e = 0.7$pu, $V_t = 1.0\angle 15°$, $V_\infty = 1.08\angle 0°$. The machine parameters H=3.2sec, T'_{do} =9.6sec, K_A= 400, T_A= 0.2 sec, R_s= 0.0, X_q= 1.7 pu, X_d = 2.0pu, X_d = 0.39*pu*, D = 0, ω_s= l00π. Using flux decay model, find initial values of state and algebraic variables, as well as V_{ref}, T_M, and K_1–K_6 constants. (15)

5. a) Draw a model of SMIB Power System using K_1 to K_6 Constants, give reasons for assuming constant mechanical power. Write expression for six constants used. (10)

b) Draw block diagram of Power system stabilizer and explain how it improves power system stability. (10)

6. a) Define Voltage Stability Factor index. Examine the stability of a two bus system supplying (40+50) MVA load through a transmission line having (0.0+j0.8)Ω impedance. (10)

b) For a two area power system determine the voltage stability with following data: (10)

	Area 1	**Area 2**
K_{PS}	105	120
R	2.5	3.0
β	0.326	0.425

Show the undesired control action occurs with B = 2β.

7. a) Define and explain Voltage Stability of Power System with the help of P-V curve. (10)

b) Explain how resonance can occur in power system. What are its effects on power system apparatus? (10)

8. a) What are problems caused by self excitation and how these can be overcome using filters and damping devices? (10)

b) Write short notes on : (10)

i) Voltage Collapse Proximity Index,

ii) Voltage stability using Bifurcation theory.