Roll No .....

MEPS/MTPA/MEHP/MTPS-102

M.E./M.Tech., I Semester

Examination, December 2014

Power System Dynamics Analysis and Control

Time : Three Hours

Maximum Marks : 70

Note : Answer any five questions. All questions carry equal marks.

1. a) Describe the factors affecting voltage in stability and voltage collapse.

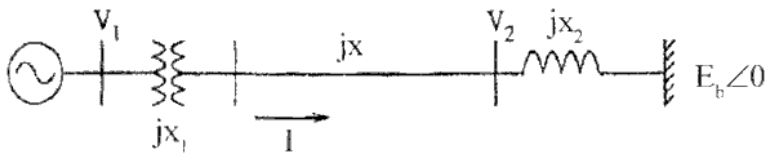
   b) Define system security. Describe power system static security levels.

2. A 50 Hz synchronous generator is connected to an infinite bus through a line. The p.u. reactances of generator and the line are j0.3 p.u. and j0.2 p.u. respectively. The generator no load voltage is 1.1p.u. and that of infinite bus is 1.0 p.u. The inertia constant of the generator is 3MW-sec/MVA. Determine the frequency of natural oscillations if the generator is loaded to (i) 60% (ii) 75% of its maximum power transfer capacity and small perturbation in power is given.

3. Describe the effect of continuous excitation control using automatic voltage regulators based on feedback principle for dynamic analysis.

4. A single machine is connected to a load centre through a transmission line as shown in figure. The load centre is represented by a reactance connected to an infinite bus. The generator is initially operating with Pe = 1.0 p.u and the magnitude of voltages V_1 and V_2 are 1.0 p.u each. Find the

maximum step increase in the mechanical power that will not cause transient instability. Use equal area criterion. Assume $X_g = 0.3$, $X_t = 0.1$, $x = 0.4$, $X_2 = 0.1$.



5. a) Derive voltage and torque equations of a synchronous machine.

   b) A generator has the following data.

   $X_d = 1.79$, $X_{a\sigma} = 0.13$, $X'_d = 0.169$, $X''_d = 0.135$, $T'_{do} = 4.3$, $T''_{do} = 0.032$, $Xq = 1.71$, $X'_q = 0.228$, $X''_d = 0.2$, $T'_{qo} = 0.85$, $T''_{qo} = 0.05$, $f_B = 50$ Hz.
   Compute the equivalent circuit parameters.

6. Enumerate transient response of a synchronous machine under:
   a) Connected to a voltage source
   b) Connected to an external network

7. What is the objective of excitation system in synchronous machine? Describe the types, and modeling of the various components of the excitation system.

8. Write short notes on any two of the following :
   a) Small signal analysis
   b) Modeling of transmission line
   c) Dynamic load
   d) Power system stabilizer.

******