CBCS Scheme

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16/17EPS13

First Semester M.Tech. Degree Examination, June/July 2018
Power System Dynamics (Stability and Control)

Time: 3 hrs. Max. Marks: 80

Note: *Answer FIVE full questions, choosing one full question from each module.*

Module-1

1 a. Illustrate with neat sketch the states of power system operation and system security. **(06 Marks)**

b. Obtain swing equation considering classical model of generator. Also state the assumptions made in deriving equivalent circuit from single line diagram. **(05 Marks)**

c. A generator is connected to an infinite bus through an external impedance of jx_e. The generator is represented by a voltage source $E_g|\underline{\delta}$ in series with a reactance x_g. if $E_g = E_b$ (infinite bus voltage) = 1.0, $x_e = -0.5$, $x_g = 0.3$ (all in pu) for $P_b = 1.0$p.u, find the equilibrium values of δ, in the range of $(-\pi, \pi)$ test their stability (P_b is the received power at the infinite bus). Assume infinite bus angle as zero. **(05 Marks)**

OR

2 a. Deduce the necessary condition for analyzing the equilibrium point of steady state stability with the help of power angle curve. **(04 Marks)**

b. Analyze transient stability using equal area criteria. **(04 Marks)**

c. Examine the model the synchronous machine through Park's transformation. **(08 Marks)**

Module-2

3 a. Examine the two axes of synchronous machine with the help of equivalent circuits. **(04 Marks)**

b. Write note on short circuit tests, decrement tests and frequency response tests. **(06 Marks)**

c. Analyze the transient response considering following conditions.
   i) Connected to a voltage source
   ii) Connected to an external network. **(06 Marks)**

OR

4 a. Describe the excitation system with a neat functional block diagram. **(06 Marks)**

b. Write a short note on Excitation System Stabilizer (ESS) and Transient Gain Reduction (TGR). **(04 Marks)**

c. Discuss briefly speed governing systems. **(06 Marks)**

Module-3

5 a. Discuss the transformation of D-Q components in modeling a transmission network. **(10 Marks)**

b. Explain D-Q transformation through $\alpha - \beta$ variables. **(06 Marks)**

OR

6 a. Explain different types of SVC and also illustrate its control characteristics. **(08 Marks)**

b. Explain the application of model 1.1 for the representation of synchronous machine. **(08 Marks)**

Module-4

7 a. Illustrate and explain with a neat block diagram representation the small signal analysis and excitation system. **(08 Marks)**

b. Describe the computation of Heffron Philips constants for lossless network. **(04 Marks)**

c. Briefly discuss the simplified and detailed model for small signal analysis of single machine system. **(04 Marks)**

OR

8 a. Explain the basic concepts in applying power system stabilizer (PSS). **(08 Marks)**

b. Illustrate the structure and tuning of PSS with the help of block diagram. **(08 Marks)**

Module-5

9 a. Discuss the concept of inclusion of load and SVC dynamics in multi machine system. **(08 Marks)**

b. Write a note on modal analysis of large power systems. **(04 Marks)**

c. Briefly explain case studies of two area system with respect to multi machine system. **(04 Marks)**

OR

10 a. List the requirement of solution method of DAE (Differential Algebraic Equations) and hence classify the solution approaches. **(06 Marks)**

b. Describe the concept of transient saliency and hence categorize the special techniques to handle transient saliency. **(05 Marks)**

c. Discuss the methods for providing the solution of system equations for transient stability evaluation. **(05 Marks)**

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