

1108  
M.E. Electrical Engineering (Power Systems)  
Second Semester  
EE-8201: Power Systems Dynamics and Stability

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt any five questions.

x-x-x

- I. Define and explain various types of stabilities that are studied in power system analysis. Hence explain the large disturbance voltage stability concept. How does power factor affect the real power and voltage of a system? (10)
- II. Explain how a synchronous machine infinite bus system can be represented in classical form. What are the limitations of classical model of synchronous machines? Hence deduce the power angle equation and the curve as used in stability studies. (10)
- III. A 3 phase 50 Hz synchronous generator is connected to an infinite bus through a transformer and two parallel transmission lines. The generators transient, transformer and line reactance's are  $0.20 \Omega$ ,  $0.4\Omega$ ,  $0.5\Omega$ ,  $0.5\Omega$ , respectively. The mechanical input power to the generator is 0.9 p.u. the grid is consuming a complex power of  $0.8+j0.6$  p.u. Comment on the stability when a 3 phase-to-ground fault takes place at the generator terminal and the system returns to its pre-fault condition after fault clearing. Use Runge Kutta method to obtain the solution. (10)
- IV. What is critical clearing time? Why is it important? Find the expressions for the critical clearing time and angle for a generating system feeding a load through double circuit line and a 3 phase to ground fault occurs in one of the lines near the bus. The fault is cleared by simultaneous action of the breakers. Use equal area criterion to deduce the expressions. (10)
- V. Why the excitation control is required for an alternator? Show the inclusion additional variables in the mathematical model of a synchronous machine and discuss about its final state space model. (10)
- VI. How is transient energy function approach used to assess the stability of a system? How reliable is this method as compared to the traditional method. (10)
- VII. Under which condition continuous power flow analysis is carried out in power system. Hence give the steps to carry out the analysis and how does it help in assessing the stability of the system? (10)

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(2)

- VIII. What are the assessment tools to carry out for long term small signal and large signals stability analysis? How is voltage stability affected with load variations? Give the sensitivity criterion to carry out voltage stability analysis. (10)

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