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Total Number of Pages: 02

**M.TECH
EYPE204**

2nd Semester Back Examination – 2016-17

Power System Dynamics

BRANCH(S): ENERGY SYSTEMS ENGG.

Time: 3 Hours

Max Marks: 70

Q.CODE:Z839

Answer Question No.1 which is compulsory and any five from the rest.

The figures in the right hand margin indicate marks.

- Q1 Answer the following questions:** (2 x 10)
- a) Define torsional stiffness (K). What is its significance?
 - b) Compare Mid-Term and long-Term stability.
 - c) Sketch the block diagram of a single-machine infinite bus system with classical generator model(block diagram only)
 - d) Draw the V_R - P_R characteristics of a system with different load factors related to voltage stability.
 - e) Draw the equal area criterion for SIMB case and show the prefault , faulted and post fault power angle curves P_e
 - f) What is Lyapunov's method?
 - g) Explain the procedure for determining t_{cr}
 - h) What is the necessity of Power System Stabilizer?
 - i) What is participation factor and how it is useful in stability studies?
 - j) How do you classify different types of load based on voltage magnitude and load indices?
- Q2**
- a) Define power system stability. Classify power system stability. (5)
 - b) Discuss different nature of small disturbance oscillation in power system. Interpret graphically nature of small disturbance response without and with Automatic Voltage Regulator(AVR) (5)
- Q3** What is sub synchronous resonance? Why it mainly occurs in series capacitor – compensated transmission systems? Write the countermeasures to SSR problems. (10)
- Q4**
- a) What are the sources contributing to the damping of torsional oscillations? (5)
 - b) Explain the torsional instability problems due to interaction with power system controls (5)
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- Q5**
- a) With a suitable example explain clearly Hopf bifurcation (5)
 - b) Write the step by step algorithm to study the effect of loading on small signal stability (5)
- Q6**
- a) Explain how torsional oscillation in sub synchronous range could be due to Torsional fatigue duty due to network switching (5)
 - b) Classify stability of a nonlinear system depending on region of state space in which the state vector ranges & explain briefly each (5)

- Q7 Explain the design procedure of Power System Stabilizer using frequency domain method (10)
- Q8 **Write Short Notes (Any Two)** (5 x 2)
- a) Eigen properties of state matrix
 - b) Time domain simulations and direct stability analysis techniques
 - c) Multi machine PEBS
 - d) The energy function for single machine infinite bus system