Code: 15A02802

R15

B.Tech IV Year II Semester (R15) Regular Examinations April 2019

**POWER SYSTEM DYNAMICS & CONTROL**

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

**PART – A**

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Identify the impact of stability problem on power system operation and control.
(b) Define transient stability.
(c) Derive the q-axis equivalent circuit of the synchronous machine.
(d) State park transformation matrix.
(e) Draw the functional block diagram of an IEEE Type 1 excitation system.
(f) Briefly explain about power system stabilizer (PSS).
(g) What are the factors affecting voltage instability and collapse?
(h) List out the problems associated with torsional oscillations.
(i) Identify the major factors that contribute to the power system instability.
(j) How reactor switching will improve the transient stability?

**PART – B**

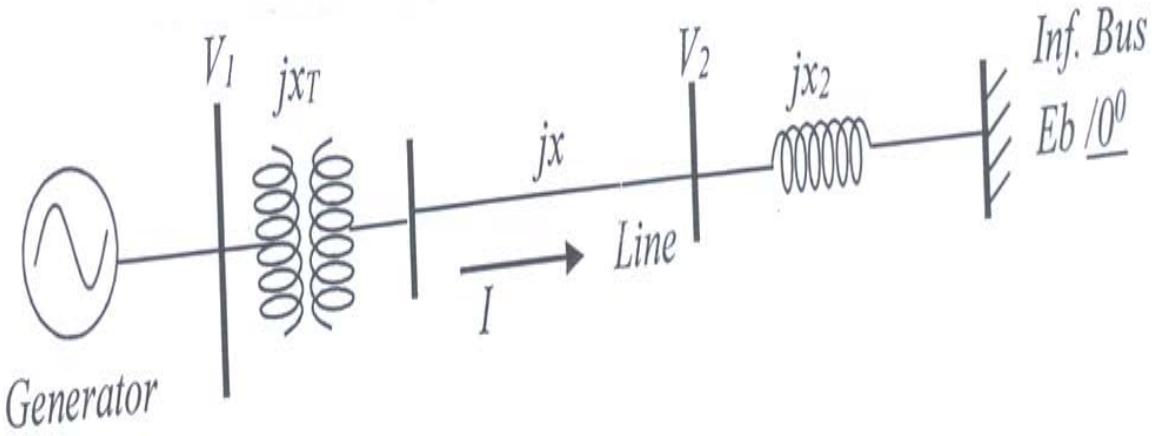
(Answer all five units, 5 X 10 = 50 Marks)

**UNIT – I**

2 Derive the criterion for steady state stability of classical model and give your remarks based on Eigen value analysis when mechanical power '$Pm$' is varied.

**OR**

3 A single machine is connected to a load centre through a transmission line as shown in figure below. The load centre is represented by a reactance connected to an infinite bus. The generator is initially operating with $P_e$ = 1.0 pu 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.

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**UNIT – II**

4 Write down the flux linkage and voltage equations of a synchronous machine and there from derive the electromagnetic torque equation.

**OR**

5 A synchronous machine delivers 1.0 p.u power at 0.8 pf lagging at its terminals. It is connected to an infinite bus of voltage 1.0 p.u through an external impedance $Z_e$ = 0.05+j0.5 p.u. The reactance of the machine are $x_d$ = 1.4 p.u, $x_q$ = 1.1 p.u and x'd = 0.25 p.u. The armature resistance is negligible. Determine E'q of the machine.

**UNIT – III**

6 Draw the block diagram of IEEE Type 1 excitation system and derive state equations.

**OR**

7 Explain the mathematical modeling of:
(a) Governor for hydraulic turbine.
(b) Single reheat tandem-compound steam turbine.

**UNIT – IV**

8 Using small signal analysis, obtain stator algebraic equations and rotor mechanical equations in linearized form.

**OR**

9 Derive generator equation with center of inertia as reference and explain the advantages.

**UNIT – V**

10 Explain in detail about the tuning procedure for power system stabilizer (PSS).

**OR**

11 Explain the applications of PSS based on the various modes of oscillation in a practical power system.

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