M.Tech Morning D:. 2/06/14

Student Exam No:-_____

GANPAT UNIVERSITY
M.TECH SEM-II ELECTRICAL ENGINEERING
REGULAR EXAMINATION - MAY 2014
3EE202:-Power System Dynamics And Control

Time: 3 Hours **Total Marks:-70**

Instructions: - 1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

SECTION-I

Que-1 (a) With necessary assumptions derive expression for open circuit voltage phasor for synchronous generator. **[06]**

(b) The active power delivered by salient pole generator to the infinite bus through short transmission line is 0.6 pu.The infinite bus voltage is $V\infty=1\angle 0^0$,and value of generator voltage Eg =1.4 .synchronous generators reactances Xd =1.6 and Xq=1.0 and the line reactance Xl =0.4. Find the value of Ea and Ia by neglecting armature resistance. **[06]**

OR

Que-1 (a) Derive an expression of stator self-inductances of ideal salient-pole synchronous machine in terms of rotor position with usual notations. **[06]**

(b) An alternator is synchronized with an infinite bus. At synchronization field current is unchanged to $i_F=1*10^3$A (actual) .The infinite bus voltage ($V\infty$) being reference is 1/0° and synchronous reactance is 1.5 pu . With i_F unchanged the steam valves at the turbine are adjusted until PG = 0.3. Then (a) Find Armature current Ia. (b) With PG unchanged, i_F is unchanged to 1600 A (actual). Find current Ia. **[06]**

Que- 2 (a) Sketch model of speed governing system for hydro-turbines and discuss permanent droop and transient droop. **[06]**

(b) Draw schematic diagram of 2.2 model generator and Write inductance matrix for it with all sub matrix components. **[05]**

OR

Que- 2 (a) Enlist the types of excitation system and Explain of DC-1 type excitation system. **[07]**

(b) A synchronous generator has a round-rotor configuration with Va = 1.0 pu and synchronous reactance Xs of 1.6 , r = 0.004 and Ia =1 ∠-60°. Find induced EMF Ea and also draw a phasor diagram. **[04]**

Que-3 **Attempt any two.** **[12]**

(a) Derive mechanical equation for alternator from basic theory of energy consumption principle

(b) Draw equivalent circuit model of synchronous machine and write Park's circuit voltage equation for synchronous machine

(c) Draw and Explain various types of steam turbine system models.

SECTION:II

Que-4 (a) Write a short note on SVC modeling for stability analysis. **[06]**

(b) Explain the constant impedance, constant current and constant power loads with respect to static load modeling. **[05]**

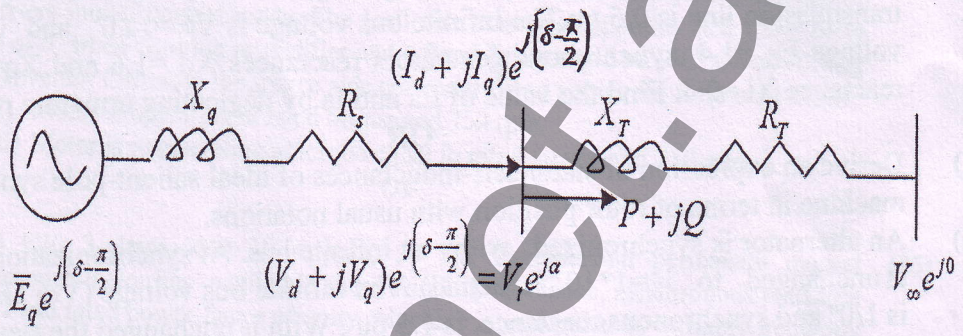
OR

Que- 4 (a) What is park's transformation ? Explain the importance of parks transformation in synchronous machine dynamic studies, **[05]**

(b) Explain the induction motor modeling in SI unit. **[06]**

Que- 5 (a) Explain various modes of oscillations with respect to power system stability. **[03]**

(b) The equivalent circuit of single machine connected to infinite bus is shown in figure. **[09]**



single machine connected to an infinite bus

Draw the phasor diagram of steady state SMIB system, and derive the output torque equation for synchronous machine

OR

Que- 5 (a) Derive the equation of apparent power supplied by synchronous generator to infinite bus in SMIB system. **[08]**

(b) Draw the phasor diagram of steady state synchronous generator connected to infinite bus. **[04]**

Que-6 **Attempt any two.** **[12]**

(a) Derive the power balance equation for multi-machine system.

(b) Derive equation for direct axis and quadrature axis voltages (Vd,Vq) of an alternator considering balanced terminal Voltages with Va (t) = $\sqrt{2}$ |V| cos (Wo t + ∠V). The rotation of generator is described by θ = W1 t + (Л/ 2) + δ (a) for non-synchronous operation Wo≠W1(b) When Wo=W1.

(c) Explain transmission line modeling for stability analysis.

END OF PAPER

Best of Luck