Student Exam No:-_____

GANPAT UNIVERSITY
M.TECH SEM-II ELECTRICAL ENGINEERING
REGULAR EXAMINATION JULY-2013
3EE202:-. Power System Dynamics & 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.

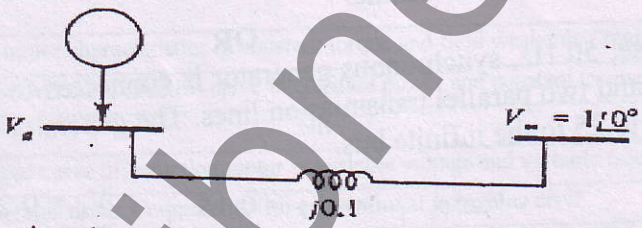
SECTION-I

Que-1 **(a)** A generator is synchronized to an infinite bus i_F=1000A (actual) at synchronization i_F unchanged V_∞=1/0° and Xs=1.5. With i_F unchanged the steam valves at the turbineare adjusted until PG=0.2. Then (a) Find Ia. (b) With PG unchanged i_F is unchanged to 1600 A (actual). Find current Ia. **[06]**

(b) What is the effect of armature reaction in case of modeling of a synchronous generator? Explain procedure of synchronizing a generator to an infinite bus. **[06]**

OR

Que-1 **(a)** Consider the system shown in figure having X_d=1.0, Xq=0.6, X'_d=0.2 and T'_{do}=4 sec. and negligible resistances. **[06]**



The generator has just been synchronized to the infinite bus. When PM is slowly increased until P_G=0.5. E_{fd} is not changed. In the new steady state, Find Va, Ia, Ea and E'a.

(b) State basic assumptions made in steady state analysis of an alternator and derive open circuit voltage equation of it. **[06]**

Que- 2 **(a)** Explain modeling of speed-governing system for hydro turbines. **[06]**

(b) Explain field controlled alternator rectifier excitation system with diagram. **[05]**

OR

Que- 2 **(a)** Draw and explain IEEE Type-1 excitation system. Also explain Excitation System Stabilizer (ESS) and Transient Gain Reduction (TGR) for excitation system modeling. **[06]**

(b) Derive expression of stator self-inductances of ideal salient-pole synchronous machine in terms of rotor position with usual notations. **[05]**

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

(a) Discuss the power delivered by Synchronous machine and explain the effect of saliency.

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

(c) Derive mechanical equations for alternator from basics of energy consumption principle.

SECTION-II

Que-4 (a) For single machine infinite bus system, derive Heffron-Phillips state space model. [07]

(b) Explain classification of different modes of oscillations. [04]

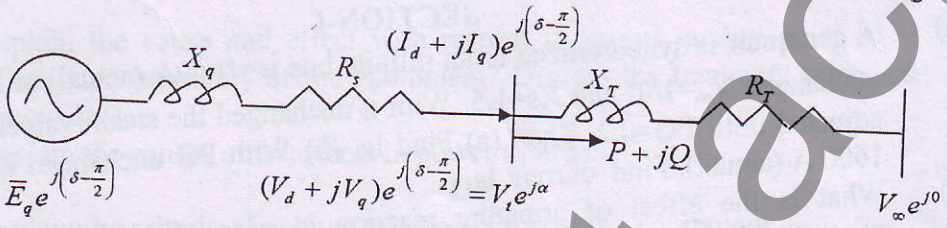
OR

Que- 4 (a) Discuss how we can linearize nonlinear system. [03]

(b) Explain power system stabilizer. [03]

Que- 5 (a) Define the Park's transformation. And write the Park's transformation matrix. [08]

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

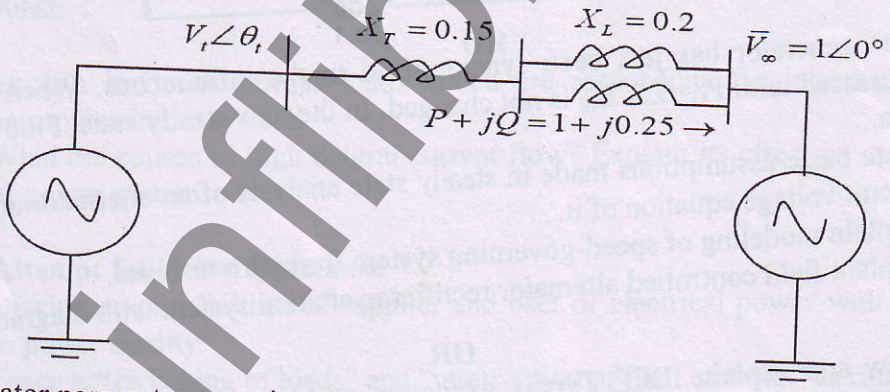


single machine connected to an infinite bus

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

OR

Que- 5 (a) A three-phase, 50 Hz, synchronous generator is connected to an infinite bus through a transformer and two parallel transmission lines. The generator is transferring a complex power of 1+ j0.25 to the infinite bus. [09]



The generator parameters are given below:

X_d=0.8, X_q=0.7, X'_d=0.3, X_{ls}=0.2, R_s=0.025, K_A=20, K_E=1.0, T_E=0.36, K_F=0.125, T_F=1.8 .Find E_{fd}, Ψ_{1d} and Ψ_{2q} for the synchronous generator.

(b) Define the Clark's transformation. And write the Clark's transformation matrix. [03]

ue-6 **Attempt any two.**

(a) Classify load models. Explain static load representation in details. [12]

(b) Explain Static VAR Compensator Modeling. State their applications.

(c) Discuss the modeling of Induction motor.

END OF PAPER

Best of Luck