Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Examination July 2010

Subject code: 720703

Subject Name: Power System Dynamics and Control

Date: 07 /07 /2010 **Time: 11.00am – 1.30pm**

Total Marks: 60

Instructions:

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

Q.1 **(a)** Draw the functional block diagram of a typical excitation control system and explain function of each block. **06**

(b) Describe three broad categories of excitation systems classified by the types of excitation power source. **06**

Q.2 **(a)** Describe voltage generation in a synchronous generator. State the assumptions made. **06**

(b) Explain the open circuit voltage of a synchronous generator and derive related expressions using usual notations. **06**

OR

(b) Write stator equations of synchronous machine. Show that if the armature flux linkage components, with respect to synchronously rotating reference frame (ψ_D and ψ_Q) are constant, then the transfer EMF terms ($d\psi_d/dt$ and $d\psi_q/dt$) and terms introduced by the variations in the rotor speed cancel each other. **06**

Q.3 For the system shown in **figure 1** and the excitation model shown in **figure 2** derive expression for ΔVd and ΔVq. **12**
(Use machine model 1.0 and neglect armature resistance.)

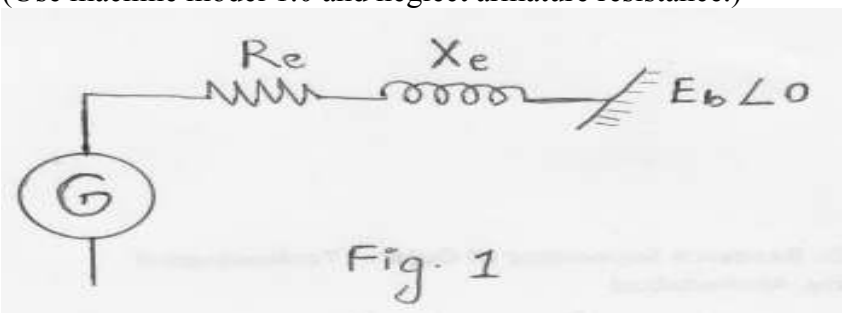


Fig. 1

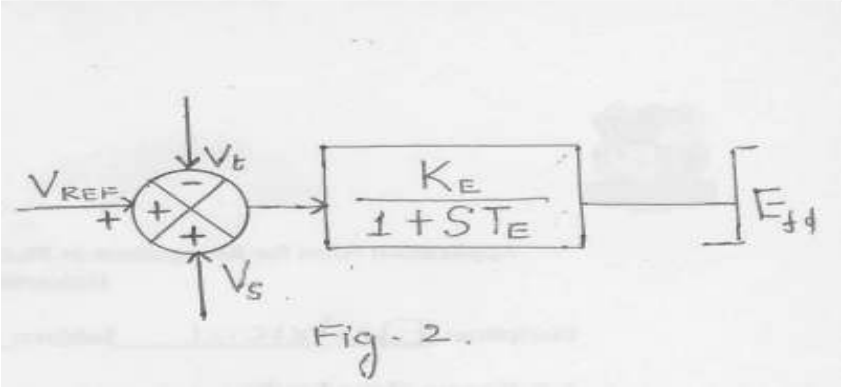


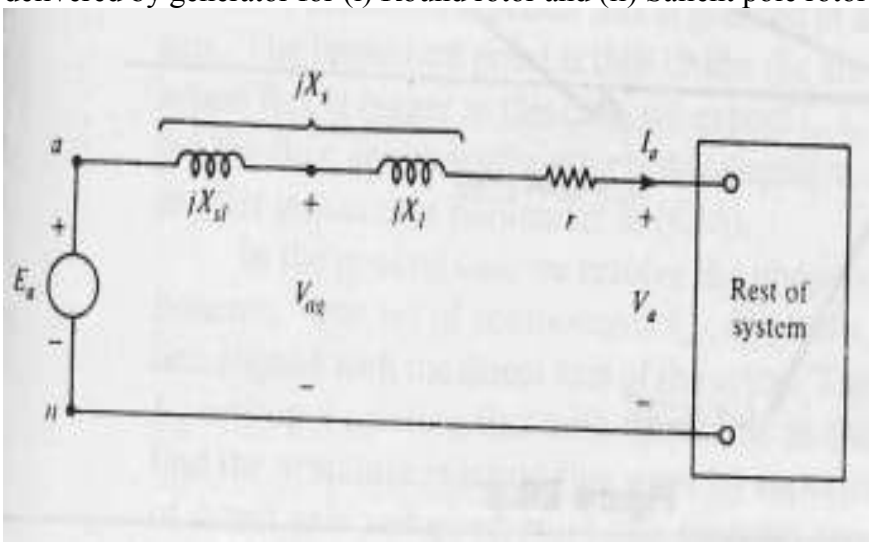
Fig. 2.

OR

Q.3 **(a)** Obtain Dynamic model of transmission line use single phase π equivalent of a transmission line and spark transformation. **08**

(b) Show that Kron's transformation is power invariant. **04**

Q.4 Using circuit shown in figure below derive the expression of power delivered by generator for (i) Round rotor and (ii) Salient pole rotor. **12**



OR

Q.4 **(a)** Explain load modeling. Describe the static load representation. **08**

(b) State the applications of SVCs. **04**

Q.5 **(a)** Derive steady state equation of transmission line using phasor notation $f=f_Q + jf_D$, Draw phase diagram showing relationship between DQ and dq variations. **06**

(b) Explain energy conversion in electromechanical system. **06**

OR

Q.5 **(a)** Explain how a simplified system model is obtained for multi-machine system. State the assumptions made. **12**

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