Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-II Remedial Examination December 2010

Subject code: 720703

Subject Name: Power System Dynamics & Control

Date: 21 /12 / 2010 **Time: 02.30 pm – 05.00 pm**

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)** Explain Power delivered by generator. **06**

(b) Prove that, if the armature flux linkage components, w.r.t. a synchronously rotating reference frame, are constants, then the transformer emf terms and terms introduced by the variations in the rotor speed cancel each other. **06**

Q.2 **(a)** Explain Armature reaction in details. **06**

(b) For synchronous generator connected to an infinite bus, Explain the behavior of the generator when **06**

(i) Mechanical power changes and I_f is fixed.

(ii) I_f changes and mechanical power fixed.

OR

(b) Derive $dE'q/dt= 1/T'_{do} [- E'q + (X_d-X'_d) i_d + E_{fd}]$ for synchronous machine of model 1.1. **06**

Q.3 **(a)** Derive Park's voltage equation in reference with synchronous machine. **06**

(b) Explain field controlled alternator rectifier excitation system with diagram. **06**

OR

Q.3 **(a)** Draw a block diagram of excitation control system. Also explain function of each block. **06**

(b) Explain potential source controlled rectifier exciter system with diagram. **06**

Q.4 **(a)** Explain line modeling by D-Q transformation using α-β variables. **06**

(b) Write short note on limiters. **06**

OR

Q.4 **(a)** State the types of 'SVC and Controllers'. Explain FC-TCR by neat sketch. **06**

(b) Write short note on Hopf Bifurcation. **06**

Q.5 **(a)** Classify load models. Explain dynamic load model in details. **06**

(b) Derive rotor mechanical equations of SMIB. From that draw a Torque-angle loop. **06**

OR

Q.5 **(a)** Explain in brief Static Var Compensators. State their applications. **06**

(b) A generator is connected to an infinite bus through an external impedance of jx_e. If $E_b=V_{to}= P_t=1.0$ p.u. Find the initial conditions. Assume $x_e=0.25$p.u. **06**

The generator data: $x_d=1.8$, $x_q=1.7$, $x'_d=0.17$, $x'_q=0.23$,

$R_a=0.0$, $T'_d=0.4$sec, $T'_q=0.1$sec, $H=4$ sec, $f_B=60$ Hz.

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