

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – II • EXAMINATION – SUMMER • 2014

Subject code: 1720703

Date: 20-06-2014

Subject Name: Power System Dynamics and Control

Time: 02:30 pm - 05:00 pm

Total Marks: 70

Instructions:

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

- Q.1** (a) Derive the equation of instantaneous electromagnetic torque (T_e), for a synchronous machine, in terms of $d-q$ variables in rotor reference frame. **07**
- (b) Briefly describe Park's transformation and explain its importance in power system analysis. **07**
- Q.2** (a) Mention the basic assumptions and derive the equation of terminal voltage of a smooth cylindrical rotor alternator, in sinusoidal steady state condition. **07**
- (b) Derive the relation between the $d-Q$ parameters in synchronous reference frame and $d-q$ parameters in rotor reference frame for a synchronous machine. **07**
- OR**
- (b) Explain the difference between steady state analysis and transient analysis. Give suitable examples and briefly explain each one of them. **07**
- Q.3** (a) Draw the equivalent circuit of a synchronous machine and derive the equation of its instantaneous power output. **07**
- (b) Draw and explain the phasor diagrams for smooth cylindrical and salient pole alternators in sinusoidal steady state condition. **07**
- OR**
- Q.3** (a) State and explain the conditions for synchronizing an alternator with infinite bus. Assume constant field excitation and fixed mechanical power input. **07**
- (b) Explain the effect of change in excitation as well as change in mechanical power input for an alternator connected to infinite bus. **07**
- Q.4** (a) Mention different types of excitation systems. Draw and explain the block diagram of any one of them. **07**
- (b) Write a short note on transmission line model used for dynamic analysis of power system. **07**
- OR**
- Q.4** (a) Explain the speed governing system for hydro turbine with necessary schematic diagram. **07**
- (b) Draw block diagram of SVC controller and explain the control characteristic of SVC. **07**
- Q.5** (a) List the types of load model used in power system analysis. Also mention appropriate application for each one of them **07**
- (b) Write a short note on Hopf bifurcation. **07**
- OR**
- Q.5** (a) State the common assumptions in dynamic analysis of a multi machine system. Develop a simplified system model for the same. **07**
- (b) What do you mean by small signal analysis of a system? How it is better compared to simulation of a system? **07**