

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject code: 1720703

Date: 04-12-2014

Subject Name: Power system dynamics & 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) State basic assumptions made in steady state analysis of an alternator and also derive open circuit voltage equation for it. 07
(b) Derive equation for power delivered for round & salient pole rotor, discuss effect of saliency on PG – Delta(m) curve. 07

- Q.2 (a) From basic of energy consumption principle derive mechanical equation for alternator. 07
(b) Explain how results of asynchronous operation of alternator is modified when we consider synchronous operation 07

OR

- (b) Using Park transformation derive voltage equation of synchronous machine. Also state importance of Park transformation. 07

- Q.3 (a) Derive mutual inductance matrix for synchronous machine. 07
(b) State and explain the conditions for synchronizing alternator with infinite bus considering fixed i_f and fixed mechanical power i / p . 07

OR

- Q.3 (a) Explain potential source controlled rectifier exciter system with diagram. 07
(b) Draw and explain speed-governing system and model of speed-governing system for hydro turbines. 07

- Q.4 (a) Explain types of SVC. Where it is used ? 07
(b) How D – Q model of transmission line is converted into $\alpha - \beta$ model using clark's transformation. Define Clark's transformation matrix and also state advantages of $\alpha - \beta$ model of transmission line model 07

OR

- Q.4 (a) Develop dynamic model of synchronous machine with field circuit and one equivalent damper winding on Q-axis (Madel 1.1). Develop all equations for initial conditions, considering slip is 1. 07
(b) Why load is consider as a constant impedance model. Justify your answer and classify the system load. 07

- Q.5 (a) Carry out small signal analysis of stator of synchronous machine connected to an infinite bus. Develop all mathematical equations. Also draw its block diagram. 07
(b) Find out transfer function of a synchronous machine connected to an infinite bus. Also represent its over all block diagram. How its characteristics equations are used to find stability criterion for with and without AVR. 07

OR

- Q.5 (a) State assumptions made in multy machine system and develop simplified system model for the same. 07
(b) Explain how synchronous machine can be model in terms of equivalent circuit Also derive equation for instantaneous power output. 07