## **GUJARAT TECHNOLOGICAL UNIVERSITY** BE - SEMESTER-VII • EXAMINATION – WINTER • 2014

Subject Code: 172401 Date: 25-11- Subject Name: Power Electronics Systems Modeling		014	
Ti	Time: 10:30 am - 01:00 pm Total Marks: 70 Instructions:		)
1115		Attempt all questions. Make suitable assumptions wherever necessary.	
Q.1	(a) (b)	Discuss the concept of nonlinearity and the importance of perturbation & linearization with respect to power electronics giving an example. Discuss different types of modeling methods with their merit and demerits.	07 07
Q.2	(a)	Derive the expression of duty cycle for boost converter with the help of capacitor	07
	(b)	charge second principle. Develop the model of Armature controlled DC servo motor. <b>OR</b>	07
	<b>(b</b> )	Explain DC transformer model with necessary equations and figures.	07
Q.3	<b>(a)</b>	Explain the modeling the boost converter inclusion inductor copper loss. Draw the waveform for inductor voltage and capacitor current waveforms.	07
	<b>(b</b> )	Derive small signal linearized equation that describes change in inductor current. OR	07
Q.3	(a)	Explain the modeling of boost converter inclusion of semiconductor conduction	07
	<b>(b</b> )	losses. Draw the waveform for inductor voltage and capacitor current. Show that during transient period net change in inductor current over one switching period can be correctly predicted by use of average inductor voltage.	07
Q.4	(a)	Find out the steady state output voltage for a boost chopper using small-ripple approximation. Draw necessary diagrams & waveforms. Also derive the equation for voltage conversion ratio M (D) and draw its graph.	07
	<b>(b)</b>	What is a Transfer Matrix & how it is obtained from state-space equations? OR	07
Q.4	(a)	Find out the steady state output voltage for a buck chopper using small-ripple approximation. Draw necessary diagrams & waveforms. Also derive the equation for voltage conversion ratio M (D) and draw its graph.	07
	<b>(b</b> )	How the review of bode plot is useful in analysis of converters?	07
Q.5	<b>(a)</b>	What is feedback control? Explain the closed loop of controlled rectifier with necessary circuit diagram and waveform.	07
	<b>(b)</b>	Find the state-space model of the second-order differential equation. $\ddot{x} + a\dot{x} + bx = f(t).$	07
		OR	
Q.5	(a)	What is linearization? Explain linearized circuit for an up/down converter in discontinuous conduction using necessary circuit, equation and waveform.	07

1

(b) Derive state space for the following circuit diagram.

