Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – SUMMER • 2014

Subject Code: 172401 **Date: 22-05-2014**

Subject Name: Power Electronics Systems Modeling

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)	Draw and Explain the block diagram of Power Electronics System with reference to modeling.	**07**
	(b)	State inductor volt-second balance principle and explain its use in buck converter.	**07**
Q.2	(a)	Explain DC transformer model with necessary equations and figures.	**06**
	(b)	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 it's graph.	**08**
		OR	
	(b)	For a given buck converter, if the input voltage is 50 V, Mark Space Ratio is 0.25, Switching frequency is 100 kHz and load resistance is 10 Ω, calculate the value of V_o and I. Also find out the value of C such that the peak output voltage ripple ΔV is 5% of V_0.	**08**
Q.3	(a)	Discuss different types of modeling methods with their merit and demerits.	**07**
	(b)	List the major steps of engineering design process. Explain each in brief.	**07**
		OR	
Q.3	(a)	What do you mean by small signal approximation? Explain with appropriate example.	**06**
	(b)	Why is AC modeling required? Discuss non-linearity in electrical system. Explain perturbation and linearization w.r.t. power electronics.	**08**
Q.4	(a)	Develop the state space model of a buck converter. Draw necessary figures.	**08**
	(b)	Define the following: Modeling, Controllability, SISO, Normalization, Impulse Response, Linerization	**06**
		OR	
Q. 4	(a)	Explain the difference between ideal and physical models of AC transformer. Draw neat diagrams.	**06**
	(b)	Develop the state space model of a boost converter along with necessary figures.	**08**
Q.5	(a)	What is Canonical Circuit Model? Explain the manipulation of buck-boost converter model into canonical form.	**07**
	(b)	Explain the graphical construction of series impedances using a series R-C network.	**07**
		OR	
Q.5	(a)	Explain the close loop speed control of DC motor using power electronics converter.	**07**
	(b)	Explain the state space model of a full bridge inverter.	**07**

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