Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEM-VII Examination-Nov/Dec.-2011

Subject code: 172401 **Date: 19/11/2011**
Subject Name: Power Electronics Systems Modelling
Time: 10.30 am-01.00 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. Explain feed-forward and disturbances w.r.t. to the block diagram in brief. **07**

(b) State capacitor charge balance principle and explain its use in buck converter. **07**

Q.2 (a) What do you mean by a normalized model? Explain in brief. Also explain the concept of controllability and observability in brief. **07**

(b) Explain the manipulation of buck-boost converter model into canonical form. **07**

OR

(b) Explain the modeling of pulse width modulator with necessary waveforms and equations. Also draw the pwm model including sampler. **07**

Q.3 (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 it's graph. **07**

(b) Discuss the concept of nonlinearity and the importance of perturbation & linearization with respect to power electronics giving an example. **07**

OR

Q.3 (a) 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 $V_{0.}$ **07**

(b) List the major steps of engineering design process. Explain each in brief. **07**

Q.4 (a) Develop the state space model of a buck converter. Draw necessary figures. **07**

(b) Define the following: Model, Controllability, Observability, MIMO, Normalization, Impulse Response, Linerization **07**

OR

Q. 4 (a) Discuss the development of Canonical Circuit Model based on physical arguments giving its importance. **07**

(b) Develop the state space model of a boost converter along with necessary figures. **07**

Q.5 (a) Develop the model of Armature controlled DC servo motor. **07**

(b) Draw and explain the ideal and physical models of AC transformer. **07**

OR

Q.5 (a) Explain the close loop speed control of DC motor using power electronics converter. **07**

(b) Formulate the state space model of full bridge inverter with a physical transformer **07**

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