

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VII • EXAMINATION – WINTER 2013

Subject Code: 172401**Date: 26-11-2013****Subject Name: Power Electronics Systems Modeling****Time: 10:30 TO 01:00****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) Define modeling. Draw and Explain the block diagram of Power Electronics System with reference to modeling. **07**
- (b) State capacitor charge balance principle and explain its use in buck converter. **07**
- Q.2** (a) Derive the transfer function for armature controlled DC Motor and develop block diagram for the same. **07**
- (b) Do as directed:
1. Draw the equivalent circuit during two sub intervals for boost converter including copper loss. **02**
 2. Draw inductor voltage and capacitor current waveform for the above circuit. **02**
 3. Draw and Explain output voltage v/s duty cycle graph. **03**
- OR**
- (b) Do as directed:
1. Draw the equivalent circuit during two sub intervals for cuk converter. **02**
 2. Draw inductor voltage and capacitor current waveform for the above circuit. **02**
 3. Draw and Explain graph for DC conversion ration of the cuk converter. **03**
- Q.3** (a) What is feed forward control? Explain working of open loop control with feedforward for an up/down convertor with necessary circuit and waveform. **07**
- (b) Explain the working of the buck-boost converter with neat circuit diagram and necessary waveforms. Explain the graph for DC conversion ratio $M(D)$ with duty cycle. **07**
- OR**
- Q.3** (a) What is feedback control? Explain the closed loop of controlled rectifier with necessary circuit diagram and waveform. **07**
- (b) Explain working of open loop control with feedforward for an up/down convertor with necessary circuit and waveform. **07**
- Q.4** (a) Explain the basic AC modeling approach using buck boost converter example and draw the average inductor voltage and inductor current waveform. **07**
- (b) Develop state space model of basic buck converter. **07**
- OR**
- Q.4** (a) What is canonical circuit model? Explain the development of canonical circuit model based on physical arguments. **07**
- (b) Develop state space model of buck boost converter. **07**
- Q.5** (a) Derive and plot the control-to-output transfer function for circuit of small signal equivalent circuit model of buck boost converter. **07**
- (b) Draw and explain the modeling of PWM. **07**
- OR**
- Q.5** (a) Derive and plot the line-to-output transfer function for circuit of small signal equivalent circuit model of buck boost converter. **07**
- (b) What is linearization? Explain linerized circuit for an up/down converter in discontinuous conduction using necessary circuit, equation and waveform. **07**
