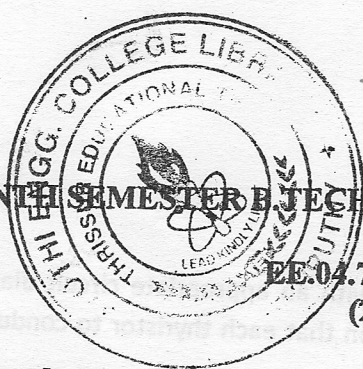


23145



Name:

Reg. No.

SEVENTH SEMESTER B.TECH. DEGREE EXAMINATION, DECEMBER 2011

EE-04.701 – Power Electronics
(2004 Admissions)

Time: Three hours

Maximum : 100 marks

I Answer all Questions:

(8 × 5 = 40)

1. Describe the effect of gate current on the forward breakover voltage of the SCR.
2. Explain how a power MOSFET can be turned-on and turned-off.
3. Describe the function of half controlled rectifier with resistive load of symmetrical configuration.
4. Discuss the advantages and disadvantages of current source thyristorized inverters over voltage source thyristorized inverters.
5. Explain the operation of a step down DC chopper feeding R-L load.
6. Explain the need for long duration gate pulses in AC voltage controller with the inductive loads.
7. Brief the working principle of Boost converter with relevant circuit and waveforms.
8. Explain the operation of linear mode power supply in detail with a block diagram.

II

(1 × 15 = 15 marks)

A) Using two transistor analogy of a SCR, explain how an SCR gets turned on when

- i) applied anode voltage exceeds the forward breakover voltage and
- ii) a gate pulse is applied to an already forward biased SCR

(OR)

B) i) Discuss the arrangements for smooth operation of parallel-connected SCRs. How are they triggered? (10)

ii) Compare SCR turned off and GTO turned off (5)

III

(1 × 15 = 15 marks)

A) Draw 3-phase half controlled rectifier with resistive load and its vector diagram of 3-phase voltages. In continuous mode (for $0 \leq \alpha \leq 30^\circ$), enumerate average load voltage, average load current and RMS load voltage. What will be the waveforms observed in conduction mode as well as discontinuous conduction?

(OR)

- B) Explain the principle of a 3-phase bridge inverter with an appropriate circuit diagram. Draw phase and line voltage waveforms on the assumption that each thyristor to conduct 120° and the load is star connected.

IV

(1 x 15 = 15 marks)

- A) i) A step up chopper has output voltage of two to four times the input voltage. For a chopping frequency of 2000 kHz, determine the range of off period for the gate signal. (6)
ii) With relevant sketches explain the operation of a voltage commutated chopper. (9)

(OR)

- B) i) Explain the operation of a cycloconverter having the output frequency one third of the input frequency. (9)
ii) Explain why the single phase ac voltage controller using two SCRs must have its triggering angle greater than load angle. (6)

V

(1 x 15 = 15 marks)

- A) With suitable circuit, explain the operation of buck-boost converter. Draw the load voltage and current waveforms. Also obtain the expression for output voltage and hence deduce the condition of duty cycle for the converter to perform buck and boost operation.

(OR)

- B) Explain the operation of switched mode power supply in detail with a block diagram. State the application of pulse width modulation technique in SMPS. Also draw the load voltage and current waveform for the duty cycle of 50 %.