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06EC73

Seventh Semester B.E. Degree Examination, June 2012

Power Electronics

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – A

1 a. Give symbol and characteristic features of the following devices :
i) SCR ii) GTO iii) TRIAC iv) IGBT v) SIT **(10 Marks)**

b. Briefly explain any five types of power electronic circuits. **(10 Marks)**

2 a. What is the need for isolation of gate-drive circuits? Discuss the different methods of providing isolation of gate-drive circuits from power circuit. **(10 Marks)**

b. Discuss the switching limits of power transistors. **(10 Marks)**

3 a. With a neat diagram, explain the two-transistor model of a thyristor. Also, derive an expression for the anode current in terms of transistor parameters α_1 and α_2. **(08 Marks)**

b. What is the need of di/dt and dv/dt protection? Explain how protection is provided. **(04 Marks)**

c. With a neat circuit diagram and waveforms, explain UJT relaxation oscillator. **(08 Marks)**

4 a. With the necessary circuit diagram, waveforms and equations, explain the operation of single-phase full converter with R-L load. **(10 Marks)**

b. Explain single-phase semiconverter with a neat circuit diagram, waveforms and equations. **(10 Marks)**

PART – B

5 a. What is commutation? Explain complementary commutation with relevant circuit diagram and waveforms. **(10 Marks)**

b. For the auxiliary commutation circuit, calculate the values of the commutation capacitor and inductor for the following data:
$V_{d_C} = 30V$, $I_{L(max)} = 15A$, t_{off} of SCR1 = 20 μsec. **(04 Marks)**

c. With a neat circuit diagram and waveforms, explain external pulse commutation. **(06 Marks)**

6 a. With neat diagrams, waveforms and equations, discuss ON-OFF control and phase control of AC voltage controllers. **(12 Marks)**

b. A single-phase full-wave AC voltage controller has a resistive load 20Ω and the input voltage is 100 V (rms), 60 Hz. The delay angles of thyristors T_1 and T_2 are : $\alpha_1 = \alpha_2 = \alpha = \frac{\pi}{2}$.
Determine : i) The rms output voltage ; ii) The input power factor ; iii) The average current of thyristors ; iv) The rms current of thyristors. **(08 Marks)**

7 a. What is chopper? How they are classified? Briefly explain. **(10 Marks)**

b. With a neat circuit diagram and waveforms, explain impulse commutated chopper. **(10 Marks)**

8 a. Explain single-phase half-bridge inverter with R load, with necessary circuit diagram and waveforms. Derive the equation for rms output voltage. **(12 Marks)**

b. Explain the performance parameters of inverters. **(08 Marks)**

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