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06EC73

Seventh Semester B.E. Degree Examination, December 2011
Power Electronics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. What are the important applications of power electronics? **(06 Marks)**

b. Explain peripheral effects of power converter system. **(06 Marks)**

c. Explain different types of power electronic converter circuits. **(08 Marks)**

2 a. Draw the equivalent model of BJT and explain the switching characteristics of power transistor. **(08 Marks)**

b. Compare the BJT and MOSFET. **(05 Marks)**

c. Discuss the different methods of providing isolation of gate drive circuits from power circuit. **(07 Marks)**

3 a. Explain the two transistor analogy of an SCR. Derive an expression for anode current. Also explain the process of regeneration cycle. **(10 Marks)**

b. Write a short note on $\frac{dv}{dt}$ and $\frac{di}{dt}$ protection. **(05 Marks)**

c. A UJT is connected across a 20 V DC supply. A valley and peak point voltages are 1 V and 15 V. The period of relaxation oscillation is 20 ms. Find the value of charging capacitor, if a charging resistor of 100 kΩ is used. **(05 Marks)**

4 a. Explain with the help of wave forms, 1-ϕ semi-converter (half bridge converter) with R-load. Derive an expression for V_0(avg) and V_0(rms). **(10 Marks)**

b. A single phase dual converter is operated from 120 V, 50 Hz supply and the load resistance R = 10 Ω the circulating inductance L_r = 40 mH delay angle are $\alpha_1 = 60°$ and $\alpha_2 = 120°$. Calculate the peak circulating current and peak current of converter. **(06 Marks)**

c. What is the use of free wheeling diode in a converter circuit? **(04 Marks)**

PART – B

5 a. Explain the self commutation with the help of neat sketch and obtain the expression for the capacitor voltage and current. **(10 Marks)**

b. Distinguish between the natural and forced commutation. **(05 Marks)**

c. In the parallel capacitor turn-off circuit shown in Fig. Q5 (c), the main SCRT, is to be reverse biased for at least 40 μs for proper commutation and holding current of auxiliary $SCRT_2$ is 2 mA. Determine the value of R and C. **(05 Marks)**

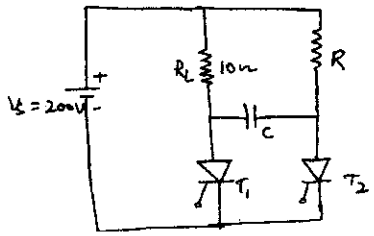

Fig. Q5 (c)

6 a. With the help of circuit diagram, explain the operation of single phase AC regulator using ON-OFF control. Derive the expression for rms value of load voltage. **(10 Marks)**

b. Explain the single phase bidirectional AC voltage controller with resistive load with waveform. **(10 Marks)**

7 a. With neat circuit diagram and explain the four quadrant chopper. **(08 Marks)**

b. With neat circuit diagram, explain the principle of operation of step up chopper. **(08 Marks)**

c. A chopper circuit is operating on Time Ration Control (TRC) at a frequency of 2 kHz on a 460 V supply of the load voltage of 350 V. Calculate the conduction period of the thyristors in each cycle. **(04 Marks)**

8 a. Explain the performance of inverters. **(06 Marks)**

b. With a neat circuit diagram, explain the principle of variable DC link. **(08 Marks)**

Write a short note on CSI (Current Source Inverter). **(06 Marks)**

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