10EC73

Seventh Semester B.E. Degree Examination, June/July 2018
Power Electronics

Time: 3 hrs.   Max. Marks:100

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

PART – A

1   a. What is a Power Converter? List the different types of power – converters and mention their conversion function. **(10 Marks)**
   b. With a neat diagram and waveforms of control signal and output voltage, explain the control characteristics of IGBT and SCR. **(06 Marks)**
   c. Discuss the peripheral effects of power electronics equipments. **(04 Marks)**

2   a. With the help of switching waveforms, explain the switching times of a power transistor. **(06 Marks)**
   b. Explain how anti – saturation base drive control improves the switching performance of BJT. **(06 Marks)**
   c. The beta (β) of BJT, shown in fig.Q2(c) varies from 12 to 75. The load resistance $R_C = 1.5\Omega$. The dc supply voltage $V_{CC} = 40V$ and input voltage to base circuit is $V_B = 6V$. If V_{CE} (sat) $= 1.6V$, $R_B = 0.7V$. Determine **(08 Marks)**
   i) Overdrive factor   ii) The forced Beta   iii)   The power loss.

Fig.Q2(c)
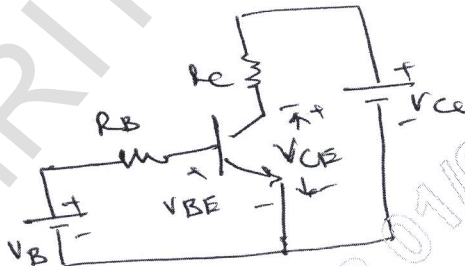
3   a. Explain the principle of a SCR using two transistor model. **(06 Marks)**
   b. Explain the turn – on and turn – off characteristics of SCR. **(08 Marks)**
   c. The latching current of a SCR inserted in between a dc voltage source of 200V and load is 100mA. Calculate the minimum width gate pulse current required to turn on this SCR in case the load consists of i) R = 20Ω in series with L = 0.2H   ii)   R = 20Ω in series with L = 2.0H. **(06 Marks)**

4   a. Explain briefly the half – wave controlled rectifier with RL load and derive the equation for output voltage. **(08 Marks)**
   b. Explain briefly the single – phase dual converters with circuit diagram and waveform. **(08 Marks)**
   c. A single phase fully controlled bridge rectifier is fed from 230V, 50Hz supply. The load is highly inductive. Find the average load voltage and current if the load resistance is 10Ω and firing angle is 45^0. **(04 Marks)**

PART – B

5 a. With a neat circuit diagram and waveforms, explain the complementary commutation and derive the necessary equations. **(10 Marks)**

b. Draw the circuit diagram of self commutation and explain briefly with waveforms and derive equations necessary. **(10 Marks)**

6 a. What is an AC – voltage controller? With the help of waveform, explain ON – OFF controller. **(06 Marks)**

b. Explain the operations of a single – phase bidirectional controller with resistive load. Obtain the necessary equations and also draw the waveforms. **(08 Marks)**

c. A single phase full wave voltage controller has a input voltage of 230V and a load having 10Ω, i.e $R = 10\Omega$. If the firing angle is 45^0, calculate the power absorbed by the load $f = 50$Hz. **(06 Marks)**

7 a. Explain the principle of operation of a step – up chopper. **(06 Marks)**

b. With a neat circuit diagram, explain the working of impulse commutated thyristor chopper. **(08 Marks)**

c. A DC chopper has a resistive load of 20Ω and input voltage 220V. When chopper is ON its voltage drop is 1.5V and chopping frequency is 10KHz. If the duty cycle is 80%, determine the average output voltage and rms output voltage and the chopper on time. **(06 Marks)**

8 a. Explain briefly the half bridge inverter with inductive load using circuit diagram and waveforms. **(06 Marks)**

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

c. Explain the variable DC link inverter with circuit diagram and waveforms. **(06 Marks)**

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