CBCS SCHEME

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15EE53

Fifth Semester B.E. Degree Examination, Dec.2019/Jan.2020
Power Electronics

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Mention the types of Power Electronic Circuits. Explain different power electronic circuits. With neat circuit diagram, input and output waveform. **(08 Marks)**

b. What is Power Electronics? Mention the major applications of Power Electronics. **(04 Marks)**

c. With circuit diagram, voltage waveforms, explain control characteristics of
i) Thyristor ii) GTO iii) MOSFET iv) BJT. **(04 Marks)**

OR

2 a. With neat circuit diagram and waveforms, explain single phase full wave rectifiers. **(07 Marks)**

b. With the help of power converter block diagram, explain peripheral effects. **(04 Marks)**

c. With the help of waveforms, explain the reverse recovery characteristics of a power diode. **(05 Marks)**

Module-2

3 a. With neat circuit diagram and switching waveforms, explain switching characteristics of BJT. **(08 Marks)**

b. Explain the switching characteristics of MOSFET with switching circuit model and waveforms. **(08 Marks)**

OR

4 a. What is the necessity of Isolating gate and base drive circuits? With circuit diagram, explain Opto – Couplers. **(08 Marks)**

b. Explain the switching limits of BJT. **(04 Marks)**

c. The bipolar transistor in fig. Q4(c), shown below is specified to have β in the range of 8 to 40. The load resistance is $h_c = 11\Omega$. The dc supply voltage is $V_{CC} = 200V$ and the input and $V_{BE(sat)} = 1.5V$, $V_B = 10V$. Find
i) The value of RB that results in saturation with an ODF of 5.
ii) The forced β and
iii) The power loss P_T in the transistor. **(04 Marks)**

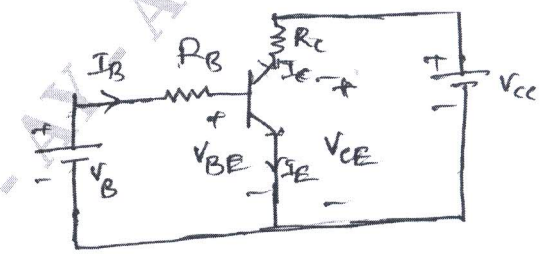

Fig.Q4(c)

Module-3

5 a. With circuit diagram and waveforms, explain RC half wave triggering circuit. **(04 Marks)**

b. Derive an expression for the anode current of thyristor with two transistor nodel. **(07 Marks)**

c. Design the values of di/dt inductor and RC snubber components for an SCR working in a 230V system. Given di/dt rating is 90A/μs and dv/dt rating is 200V/μs. Effective series resistance is 1.5Ω and damping factor is 0.6. **(05 Marks)**

OR

6 a. With neat waveforms, explain Thyristor turn – on and turn – off characteristics. **(06 Marks)**

b. With neat circuit diagrams, explain dv/dt protection of SCR. **(05 Marks)**

c. With neat diagram, explain V – I characteristics of SCR. **(05 Marks)**

Module-4

7 a. With circuit diagram and waveforms, explain the operation of 1 – ϕ dual converter. **(08 Marks)**

b. A single phase full wave AC voltage controller has a resistive load of R = 10Ω and the input voltage is V_S = 120 V(rms) , 60 Hz. The delay angle of Thyristor T_1 and T_2 are equal ; $\alpha_1 = \alpha_2 = \pi/2$. Determine i) The rms o/p voltage V_o ii) The input power factor PF iii) The average thyristor current I_A. **(08 Marks)**

OR

8 a. With circuit diagram and waveform, explain the operation of a Three phase dual converter. **(08 Marks)**

b. With circuit diagram and waveforms, explain 1 – ϕ full wave A.C voltage controllers with resistive load. **(08 Marks)**

Module-5

9 a. With the help of circuit and quadrant diagram, classify the different types of choppers. Explain four quadrant chopper with circuit diagram. **(08 Marks)**

b. A chopper is feeding and RL load as shown in fig. Q9(b) with V_S = 220V , R = 5Ω , L = 7.5mh , f = 1 KHz , K = 0.5 and E = 0V. Calculate i) The minimum instantaneous load current I_1 ii) The peak instantaneous load current I_2 iii) The maximum peak to peal load ripple current iv) The average value of load current I_a v) The rms lad control I_o. **(08 Marks)**

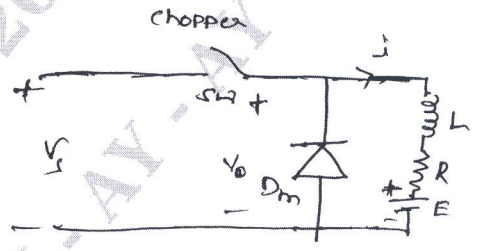

Fig.Q9(b)

OR

10 a. With circuit diagram and waveforms, explain single phase full bridge inverter. **(08 Marks)**

b. With circuit diagram and waveforms, explain three phase bridge inverter. **(08 Marks)**

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