CBCS SCHEME

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18MT62

Sixth Semester B.E. Degree Examination, July/August 2022
Power Electronics

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Explain the switching characteristics of Diode. **(10 Marks)**

b. Draw the V – I characteristics of MOSFET and briefly explain the same. **(06 Marks)**

c. Give the comparison between MOSFET and IGBT. **(04 Marks)**

OR

2 a. With neat diagram explain switching characteristics of IGBT. **(10 Marks)**

b. How devices are protected against $\frac{di}{dt}$ and $\frac{dv}{dt}$? **(05 Marks)**

c. Explain the peripheral effects of power electronics equipment. **(05 Marks)**

Module-2

3 a. Explain the turn-on and turn-off characteristics of SCR with neat diagrams. **(10 Marks)**

b. Explain with the help of a circuit diagram and relevant waveforms the commutation of a SCR using an LC circuit. **(10 Marks)**

OR

4 a. Explain with necessary figures the principle of an auxiliary thyristor assisted commutation (class C) circuit. **(10 Marks)**

b. An UJT used in a relaxation oscillator circuit is having $\eta = 0.7$, $V_V = 1V$ and the supply voltage to the circuit is 15V. Design the suitable values of R and C given that the frequency of oscillation is 1KHz. Peak current is 1mA and valley current is 8mA. **(10 Marks)**

Module-3

5 a. Derive the equations for rms output voltage of a single phase AC controllers with inductive load. **(10 Marks)**

b. A single phase half wave controlled rectifier is used to supply power to 10Ω load from 230V, 50Hz supply at a firing angle of 30° calculate :

i) Average output voltage
ii) Effective output voltage
iii) Average load current. **(10 Marks)**

OR

6 a. Find the power consumed in the heater element shown in Fig.Q6(a) if both SCRs are triggered with delay angle of 45°.

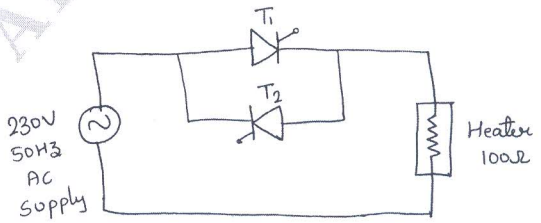

Fig.Q6(a) **(10 Marks)**

b. Explain the operation of a 3ϕ full wave fully controlled bridge rectifier with R load. **(10 Marks)**

Module-4

7 a. Describe the principle of a step down chopper of resistive load. With the help of schematic and wave diagram. Derive an expression for the output voltage. **(10 Marks)**

b. A DC chopper has a resistive load of 20Ω and input voltage $V_S = 220V$, when the chopper is on, its voltage drop is 1.5V and chopping frequency is 10KHz. If duty cycle is 80% determine the average output voltage, rms output voltage and chopper on time. **(05 Marks)**

c. Explain briefly how the choppers are classified. **(05 Marks)**

OR

8 a. Explain the operation of impulse cumulated thyristor chopper. **(10 Marks)**

b. A step up chopper has input voltage of 220V and output voltage of 660Volts. If the non conducting time of thyristor chopper is 100μsec, compute the pulse width of output voltage, In case pulse width is halved for constant frequency operation, find new output voltage. **(10 Marks)**

Module-5

9 a. Giving neat circuit diagram and waveforms, explain the working of single phase half bridge inverter with RL load. **(10 Marks)**

b. With the help of neat diagram and waveforms explain an operation of 180° mode of 3ϕ inverters. **(10 Marks)**

OR

10 a. Explain the comparison between 180° conduction mode and 120° conduction mode of 3ϕ inverter. **(10 Marks)**

b. What is PWM? What are the various PWM techniques? How do they differ from each other? **(10 Marks)**

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