

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° .

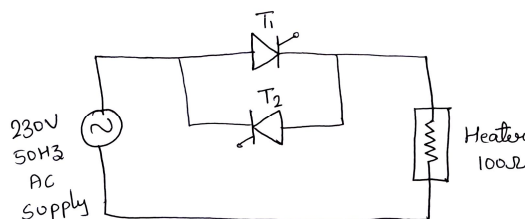


Fig.Q6(a)

(10 Marks)

- b. Explain the operation of a 3 ϕ 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 $100\mu sec$, 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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