

CBCS SCHEME

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18MT62

Sixth Semester B.E. Degree Examination, Dec.2023/Jan.2024

Power Electronics

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- a. Explain different types of power electronic converter system. Draw their input, output characteristics. (10 Marks)
- b. Draw and explain switching characteristics of power MOSFET. (10 Marks)

OR

- a. Explain the V-I characteristics of IGBT. What are the advantages of IGBT over BJT and MOSFET? (10 Marks)
- b. Describe $\frac{di}{dt}$ and $\frac{dv}{dt}$ protection for transistor. (10 Marks)

Module-2

- a. Distinguish between holding current and latching current of a thyristor. (10 Marks)
- b. Calculate the required parameters for snubber circuit to provide dv/dt protection to a SCR used in a single phase bridge converter. The SCR has a maximum $\frac{dv}{dt}$ capability of $60v/\mu s$. The input line to line voltage has a peak of 425V and the source inductance is 0.2mH. (10 Marks)

OR

- a. With necessary circuit diagram and waveform. Explain the impulse commutation techniques. (10 Marks)
- b. In the Fig.Q.4(b), the initial capacitor voltage $V_0 = 500V$, capacitance $C = 25\mu F$ and inductance $L = 10\mu H$. Determine the peak value of resonant current and the conduction time of thyristor T_1 . (05 Marks)

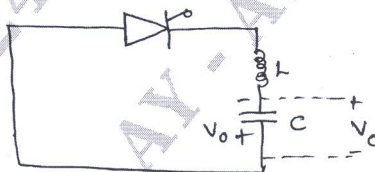


Fig.Q.4(b)

- c. Give the difference between the self commutation and impulse commutation techniques. (05 Marks)

Module-3

- a. Derive an expression for rms value of the output voltage of 1ϕ full wave bidirectional controller. (10 Marks)
- b. An on/off controller, with an input of 230V, 50Hz is connected to a resistive load of 20Ω . The circuit is operating with the switch ON for 30 cycles and OFF for 30 cycles. Determine:
 - RMS output current
 - Input power factor.(10 Marks)

OR

- 6 a. Describe the operation of single phase semi-converter feeding resistive load. Obtain an expression for the average DC output voltage. (10 Marks)
- b. 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° . Draw the supply current waveform. (10 Marks)

Module-4

- 7 a. With the help of circuit and waveforms explain the operation of step up chopper. (10 Marks)
- b. Mention various performance parameters for the step up and step down choppers. (10 Marks)

OR

- 8 a. How choppers are classified? Explain the operation of the various types of choppers. (10 Marks)
- b. A step-up chopper has input voltage of 220V and output voltage of 660V. If the nonconducting time of thyristor chopper is $100\mu\text{sec}$, compute the pulse width of output voltage. In case pulse width is halved for constant frequency operation, find the new output voltage. (10 Marks)

Module-5

- 9 a. Explain the operation of a 1ϕ half bridge inverter supplying resistive load. (10 Marks)
- b. Explain the performance parameters of an inverter. (10 Marks)

OR

- 10 a. Explain the concept of sinusoidal modulation technique of voltage control inverter. (10 Marks)
- b. A 3ϕ bridge inverter is operated from 200V dc supply in 180° mode. Determine:
- rms value of line voltage
 - rms value of fundamental component of line voltage. (10 Marks)
