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Seventh Semester B.E. Degree Examination, Feb./Mar. 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. List out any five applications of power electronics. (05 Marks)
b. Give symbol and characteristics features of the following devices:
i) SCR ii) TRIAC iii) IGBT iv) GTO v) LASCR. (10 Marks)
c. Explain the peripheral effects of power electronics. (05 Marks)

OR

- 2 a. Explain the steady state V-I characteristics of IGBT and switching characteristics of MOSFET. (10 Marks)
b. List out the merits of MOSFETs. (05 Marks)
c. Explain how transistors are protected against high di/dt. (05 Marks)

Module-2

- 3 a. With a neat sketch, describe the two transistor model of a thyristor and obtain the expression for anode current. (10 Marks)
b. Explain, thyristor characteristics and modes of operations. (10 Marks)

OR

- 4 a. Bring out the differences between natural and forced commutations. (04 Marks)
b. Explain the operation of a full wave RC firing circuit with waveforms. (08 Marks)
c. A UJT is connected across a 20V DC supply the valley and peak point voltages are 1 volt and 15V. The period of UJT relaxation oscillator is 20ms. Find the value of charging capacitor, if a charging resistor of 100K Ω is used. (08 Marks)

Module-3

- 5 a. Explain the working of single phase dual converter. How it operates in four quadrants? (10 Marks)
b. Derive an expression for average value of output voltage for 1 ϕ full wave controlled rectifier with RL load. (10 Marks)

OR

- 6 a. With a neat diagram and relevant waveforms explain 1 ϕ full wave controller for ON-OFF control. Derive an expression for rms value of load voltage in on-off AC voltage controller. (10 Marks)
b. Explain 1 ϕ Bidirectional AC voltage controllers with inductive loads. (06 Marks)
c. In an ON-OFF control circuit using 1 ϕ , 230V, 50hz supply the ON time is 10 cycles and OFF time is 4 cycles. Calculate the RMS value of the output voltage. (04 Marks)

**Module-4**

- 7 a. Explain the principle of operation of step down chopper with R load. (08 Marks)
b. A DC chopper has a resistive load of 30Ω and input voltage $V_S = 220V$. When the chopper is ON, the voltage drop is $1.5V$ and chopping frequency is $20kHz$. If duty cycle is 60% , determine the average output voltage, rms output voltage and chopper on time. (08 Marks)
c. With relevant graphs, explain how choppers are classified. (04 Marks)

OR

- 8 a. With neat figure, explain buck regulator. (10 Marks)
b. With the help of circuit diagram and relevant waveforms, explain the working of a Buck-Boost regulator. (10 Marks)

Module-5

- 9 a. Explain the operation of single phase half bridge inverter with inductive load, derive the expression for rms output voltage if the input is square wave with peak output voltage is $V/2$. (10 Marks)
b. Explain the performance parameters of inverters. (10 Marks)

OR

- 10 a. Explain the operation of thyristorized current source inverter. What are its advantages? (10 Marks)
b. Write short note on:
i) DC-link inverter ii) Sinusoidal PWM. (10 Marks)

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