CBCS SCHEME

17EC73

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) TRAIC   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 100KΩ is used.   **(08 Marks)**

Module-3

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

OR

6 a. With a neat diagram and relevant waveforms explain 1ϕ 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 1ϕ Bidirectional AC voltage controllers with inductive loads.   **(06 Marks)**
   c. In an ON-OFF control circuit using 1ϕ, 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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