R20

B.Tech II Year II Semester (R20) Regular & Supplementary Examinations August/September 2023
POWER ELECTRONICS
(Electrical & Electronics Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
  (a)   Define Latching Current.   2M
  (b)   What are the necessary conditions for turning-ON a SCR?   2M
  (c)   What is the reactive power input of the single-phase full converter at $\alpha = 30°$.   2M
  (d)   Define delay or firing angle.   2M
  (e)   Define duty cycle. What is the duty cycle ratio for Buck converter?   2M
  (f)   List the advantages and disadvantages of Boost converter.   2M
  (g)   Write the applications of Dual Converter.   2M
  (h)   What is the principle of operation of Inverter?   2M
  (i)   What is a Cyclo- Converter?   2M
  (j)   Draw the waveforms for 1-phase fully controlled ac regulator with inductive load.   2M

PART – B
(Answer all the questions: 05 X 10 = 50 Marks)

2   (a)   Explain the different modes of operation of thyristor with the help of its V-I characteristics.   5M
    (b)   Define the following terms with reference to SCR: (i) Peak inverse voltage, (ii) Voltage safety   5M
          factor.
OR
3   (a)   Draw and explain the Switching characteristics of power MOSFET.   5M
    (b)   What is IGBT? What are the advantages of IGBT over the power BJT and power MOSFET?   5M

4   (a)   Explain the working of three phase full wave converter for a firing delay angle of 45 degrees.   5M
    (b)   A single-phase full wave converter bridge is connected to RLE load the supply voltage is 230v,   5M
          50 Hz, the average load current of 10A is constant over the working range. For R = 0.4 ohms
          and L = 2mH, compute the firing angle delay for E = 120 v.
OR
5   (a)   What is half wave converter? Derive the expression for an average DC output voltage of a   5M
          single-phase half wave converter with R load.
    (b)   A fully controlled single phase Rectifier is supplied at 230 V, 50 Hz. The supply source   5M
          inductance is 3 mH. Neglecting resistance voltage drop, obtain the overlap angle when the
          rectifier is operating at a firing angle of 30^0 and supplying a load current of 10 A. Determine
          also the load voltage.

6   (a)   Discuss how the output voltage of a step-up chopper can be varied beyond the level of source   5M
          voltage.
    (b)   Discuss the current limit control strategy of a Chopper.   5M
OR
7   (a)   Define chopper. What are the different types of chopper? What are the applications of   5M
          chopper?
    (b)   A chopper operating on TRC constant frequency principle is feeding a dc series motor having   5M
          an armature resistance of 0.06 ohm and a field resistance of 0.03 ohm. The average circuit
          current is 15 A and the chopper frequency is 500 Hz. The back emf of the motor is 100 V. Find
          the periods of conduction and blocking. The chopper input is 200V.

8 (a) What do you mean by voltage source and current source inverters? Explain the basic operation of a single phase voltage source inverter. 5M

(b) Explain sinusoidal pulse modulation used for PWM inverters and also write its important features. 5M

OR

9 (a) Draw a circuit of McMurray inverter and explain the operation by drawing voltage and current waveforms. 5M

(b) Explain the operation of single-phase bridge inverter with the help of waveforms. 5M

10 (a) With neat circuit diagram and waveforms explain the operation of single-phase AC voltage regulator with RL-Load. 5M

(b) A single-phase half-wave AC voltage controller is connected with a load of R = 5 ohms with an input voltage of 230 v 50Hz. If the firing angle of thyristor is 45° determine (i) RMS output voltage (ii) Power delivered to the load. 5M

OR

11 (a) Describe the basic principle of working of single-phase-to-single-phase cyclo converter for discontinuous conduction for a bridge-type cycloconverter. 5M

(b) Explain about the principle of integral cycle control. 5M

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B.Tech II Year II Semester (R20) Regular & Supplementary Examinations April/May 2024
POWER ELECTRONICS
(Electrical & Electronics Engineering)

Time: 3 hours   Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
   (a)   Sketch the switching characteristics of IGBT.   2M
   (b)   Discuss about Silicon Carbide devices.   2M
   (c)   Discuss the effect of the firing angle on the output voltage of single phase full wave rectifier.   2M
   (d)   Discuss about the Dual Converter.   2M
   (e)   Explain the concept of Duty Ratio.   2M
   (f)   Explain how the chopper can act as an active switch.   2M
   (g)   State the difference between a half-bridge and a full-bridge inverter.   2M
   (h)   What is a Pulse Width Modulation (PWM) Inverter?   2M
   (i)   Explain the principle of integral cycle control.   2M
   (j)   Classify Cyclo Converters.   2M

PART – B
(Answer all the questions: 05 X 10 = 50 Marks)

2   Discuss the turn-on and turn-off methods of a Silicon Controlled Rectifier (SCR).   10M
OR
3   Explain different operative modes of SCR with the help of its static V-I characteristics. 10M

4   Calculate (i) Average output voltage, (ii) Displacement factor and (iii) Input power factor of a   10M
         single phase fully controlled bridge converter with RL load is supplied from 230 V, 50 Hz ac
         supply. If the firing angle is 60^0.
OR
5   Explain the working principle of a single-phase half-wave-controlled rectifier with a resistive load   10M
         and highly inductive load.

6   Describe Buck Converter operation with neat output waveform in CCM.   10M
OR
7   Explain the operating principle of a Buck-Boost Converter and also derive the expression for   10M
         average output voltage.

8   Explain the operation of Mc Murray and Mc Murray Bedford inverters.   10M
OR
9   Explain the operation of three-phase bridge inverters (VSI) 180° mode of operation with detailed   10M
         waveforms.

10   Express the operation of 1-phase AC voltage controller R-L load with neat input and output   10M
         waveforms.
OR
11   Explain the operation of single-phase to single-phase step-up and step-down Cyclo Converters   10M
         with R load with input and output waveforms.

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