SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR
(AUTONOMOUS)
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QUESTION BANK (DESCRIPTIVE)

Subject with Code : Power Electronics(18EE0206)   **Course & Branch**: B.Tech & EEE

Year & Sem: II-B.Tech & II-Sem   **Regulation:** R18

UNIT –I

POWER SWITCHING DEVICES

1) Explain the Types of Power Semiconductor Devices And Mention Advantages, Applications Of

  Power Semi-Conductor Devices?   [CO1,L2][10M]

2) a) Explain V-I Characteristics Of Diode?   [CO1,L2][5M]

  b) Necessity Of Commutation, What are the Types Of Commutation?   [CO1,L2][5M]

3) Draw and explain V-I characteristics of SCR and its working.   [CO1,L4][10M]

4) Briefly explain about insulated gate bipolar transistor (IGBT) and it's switching characteristics.

                                                                            [CO1,L2][10M]

5) Explain the Resistance firing circuit with the necessary waveforms.   [CO1,L2][10M]

6) Briefly explain about metal oxide semiconductor field effect transistor (MOSFET) and it's switching

  Characteristics.   [CO1,L3][10M]

7) Explain briefly voltage commutation and Draw the output wave forms.   [CO1,L2][10M]

8) Analyze the MOSFET using its output and transfer characteristics .   [CO1,L5][10M]

9) Explain briefly current commutation and Draw the output wave forms.   [CO1,L2][10M]

10) a)Define forward break overvoltage   [CO1,L1][2M]

   b)Define reverse break overvoltage   [CO1,L1][2M]

   c)What are the classifications of power semiconductor device?   [CO1,L1][2M]

   d)Define Latching current.   [CO1,L1][2M]

   e)Define Holding current.   [CO1,L1][2M]

UNIT-II

THYRISTOR RECTIFIERS

1) Explain the operation of single phase half wave converter with R-Load at α=60 with necessary wave forms. Also derive the output voltage, output current and RMS output voltages.   [CO2,L3][10M]

2) Explain the operation of single phase Full wave converter with R-Load with necessary wave forms. Also derive the output voltage, output current and RMS output voltages.   [CO2,L2][10M]

3) a)List the different application of phase controlled converters.   [CO2,L2][5M]

    b)What is the difference between half controlled and fully controlled bridge rectifier.   [CO2,L5][5M]

4) A single phase half wave converter is operated from a 230V, 50Hz supply. If the load is Resistive of value 10 ohms and firing angle is 60^0 Determine
    i) the rectification efficiency ii) form factor iii) ripple factor
    iv) Transformer utilization factor v)Peak inverse voltage of thyristor.   [CO2,L3][10M]

5) Analyze the average and RMS load voltage of single phase fully controlled rectifier with RL load. [CO2,L5][10M]

6) Explain the operation of Three phase fully controlled rectifier with RL load and also derive the average and RMS load voltage.   [CO2,L2][10M]

7) Explain the operation of single phase half wave converter with RL-Load with necessary wave forms. Also derive the output voltage, output current and RMS output voltages.   [CO2,L2][10M]

8) Analyze the output voltage, output current &Rms voltage equations of single phase full Bridge converter with RL load.   [CO2,L3][10M]

9) Explain the operation of Three phase fully controlled rectifier with R load and also derive the average and RMS load voltage.   [CO2,L2][10M]

10) a) The Rectification efficiency   [CO2,L1][2M]
     b) Form factor   [CO2,L1][2M]
     c) Ripple factor   [CO2,L1][2M]
     d) Transformer utilization factor   [CO2,L1][2M]
     e) Peak inverse voltage of thyristor .   [CO2,L1][2M]

UNIT –III
CHOPPERS DC-DC Buck converter

1) Derive the expression for output voltage of step down chopper with neat diagrams. [CO3,L2][10M]

2) a) Describe the principle of dc chopper operation. [CO3,L2][5M]

   b) Derive an expression for its average dc output voltage. [CO3,L2][5M]

3) The buck converter has an input voltage of $E_{dc}=12V$.the required average output voltage is $E_0=5V$ At R=500Ω and the peak-to-peak output voltage is 20mV,the switching frequency is 25kHz.if the peak-to-peak ripple current of inductor is limited to 0.8A,determine (a) the duty cycle (b) the filter inductance L and (c) the filter capacitor C, and (d) the critical values of L and C. [CO3,L3][10M]

4) What is a dc chopper? Describe various types of chopper configurations. With appropriate diagram wherever necessary. [CO3,L4][10M]

5) Explain about Voltage Control Techniques for Inverters. [CO3,L2][10M]

6) Explain the buck converter operation with help of diagram and also draw the output waveforms. [CO3, L2][10M]

7) Analyze elementary operation of chopper with waveforms. [CO3,L5][10M]

8) Explain the boost converter operation with help of diagram and also draw the output waveforms. [CO3,L2][10M]

9) The boost converter has an input voltage of $E_{dc}=5V$.the required average output voltage is $E_0=15V$ And the average load current $I_0=0.5A$. The switching frequency is 25 kHz. If the L=150μH and C=220μF, determine (a) the duty cycle (b) the ripple current of inductor ΔI (c) the peak current of inductor I_2,

   (d) The ripple voltage of filter capacitor ΔV_C, and (e) the critical values of L and C. [CO3,L3][10M]

10) a) What are the advantages of dc chopper [CO3,L1][2M]

   b) What are the applications of dc chopper? [CO3,L1][2M]
   c) What is meant by duty cycle? [CO3,L1][2M]
   d) What is meant by step-down chopper? [CO3,L1][2M]
   e) What is meant by step-up chopper? [CO3,L1][2M]

UNIT-IV

SINGLE-PHASE VOLTAGE SOURCE INVERTER

1) Analyze the single-phase half bridge Voltage Source Inverter and perform steady state analysis?

[CO4,L5][10M]

2) Analyze the single-phase half bridge Voltage Source Inverter and perform steady state analysis?

[CO4,L5][10M]

3) Explain square wave operation of the inverter with neat diagrams.   [CO4,L2][10M]

4) Explain briefly bipolar sinusoidal modulation with neat diagrams.   [CO4,L2][10M]

5) Explain briefly unipolar sinusoidal modulation with neat diagrams   [CO4,L2][10M]

6) Explain briefly single pulse width modulation with neat diagrams.   [CO4,L2][10M]

7) Explain briefly multiple pulse width modulation with neat diagrams.   [CO4,L2][10M]

8) Explain briefly sinusoidal pulse width modulation with neat diagrams   [CO4,L2][10M]

9) A 1-Ø half bridge inverter has a resistive load of R= 3Ω,and the d.c source voltage Vs/2=115V.
   (a) Sketch the waveforms for V0,load current i01,currents through thyristor 1 and diode 1 and voltage
       across thyristor T1. (b)find the power delivered to load due to fundamental current (c) Check whether
       forced commutation is required.   [CO4,L3][10M]

10) a) What are the applications of inverters?   [CO4,L1][2M]

   b) What is meant by VSI.   [CO4,L1][2M]

   c) What are the different methods for forced commutation employed?   [CO4,L1][2M]

   d) What is meant by PWM control?   [CO4,L1][2M]

   e) What is meant by series inverter?   [CO4,L1][2M]

UNIT-V

THREE-PHASE VOLTAGE SOURCE INVERTER

1) Explain the three-phase Voltage Source Inverter with 120^0 conduction mode .Also derive the output voltage, output current? [CO5,L2][10M]

2) A 1-Ø full bridge inverter has RLC load of R=4Ω , L=35mH and C=155µF.The dc input voltage is 230V And the output frequency is 50Hz. (a) find an expression for load current up to fifth harmonic .also Calculate (b) RMS value of fundamental load current, (c) the power absorbed by load and the fundamental power , (d) the rms and peak currents ofeach thyristor. [CO5,L3][10M]

3) Explain the three-phase Voltage Source Inverter with 180^0 conduction mode Also derive the output voltage,outputcurrent? [CO5,L2][10M]

4) A 1-Øfull bridge inverter has a resistive load of R= 3Ω,and the d.c input voltage E_{dc}=50V.calculate i)RMS output voltage at the fundamental frequency E_1. (ii) the output power P_0 (iii) the average and peak current of each thyristor and (iv) the peak reverse –blocking voltage of each thyristor.
[CO5,L3][10M]

5) Explain briefly sinusoidal pulse width modulation with neat diagrams. [CO5,L2][10M]

6) A 1-Ø bridge inverter ,fed from 230V dc is connected to load R=10Ω and L=0.03H.Determine the power delivered to the load in case the inverter is operating at 50Hz with (a) square wave output(b) quasi square wave output with an on-period of 0.5 of a cycle and (c) two symmetrically spaced pulses per half cycle with an on-period of 0.5 of a cycle [CO5,L3][10M]

7) A 1-Ø half bridge inverter has a resistive load of R= 3Ω,and the d.c source voltage Vs/2=115V.
 (a) sketch the waveforms for V0,load current i01,currents through thyristor 1 and diode 1 and voltage across thyristor T1. (b)find the power delivered to load due to fundamental current (c) Check whether forced commutation is required. [CO5,L3][10M]

8) (a) Draw the circuit topology of all types of Voltage Source Inverter? [CO5,L5][10M]
 (b) A 1-Ø bridge inverter delivers power to a series connected RLC load with R=2Ω and ωL=10Ω.The periodic timeT=0.1 msec. What value of C should the load have in order to obtain load commutation for the SCRs. The thyristor turn off time is 10µsec.Take circuit turn off time as 1.5 t_q.Assume that load current contains only fundamental component. [CO5,L3][10M]

9) A 3-Øinverter is supplied from a 600V source for a star-connected resistive load of 15Ω/phase, find The RMS load current ,the load-power and the thyristor ratings for (i) 120^0 conduction (ii)180^0 conduction. [CO5,L3][10M]

10) A 1-Ø half bridge inverter has a resistive load of R= 3Ω,and the d.c input voltage E_{dc}=50V.calculate i)RMS output voltage at the fundamental frequency E_1. (ii) the output power P_0 (iii) the average and peak current of each thyristor and (iv) the peak reverse –blocking voltage of each thyristor.

[CO5,L3][10M]

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