SEAT No. :

[5460] - 563
T.E. (Electrical)
POWER ELECTRONICS
(2015 Pattern) (Semester - I)

Time : 2½ Hours]   *[Max. Marks :70*

Instructions to the candidates:

1) *Answer any one question from Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

4) *Assume suitable data if necessary.*

Q1) a) What is communication of SCR? Explain class C communication of SCR. **[5]**

b) Explain the working of type D chopper with appropriate waveforms to demonstrate its operation in first and fourth quadrants. Indicate the range of duty cycle for which it operates in first and fourth quadrants. **[5]**

OR

Q2) a) Derive expression for average output voltage and rms output voltage of a single phase fully controlled bridge converter feeding RL load. (assume continuous conduction) **[5]**

b) Draw and explain output and transfer characteristics of IGBT. **[5]**

Q3) a) Describe working of single phase of dual converter with output voltage waveform. **[5]**

b) Explain working of SCR. Define latching current & holding current as applicable to an SCR. Show these currents on its static V-I Characteristics. **[5]**

OR

P.T.O.

Q4) a) Explain with neat circuit diagram operation of UJT triggering circuit of Thyristor. **[5]**

b) For a type A chopper, DC source voltage Vs = 230 V, load resistance R = 10 Ω. Take a voltage drop of 2V across chopper when it is on. For duty cycle of 0.4, calculate : **[5]**

   i) Average and rms values of output voltage.

   ii) Chopper efficiency

Q5) a) Explain working of three phase fully controlled converter with RL load & firing angle of 60° Draw output voltage waveforms & obtain expression for phase voltage & Line voltage. **[8]**

b) With neat diagram explain four mode operation of a TRIAC. **[8]**

OR

Q6) a) Explain operation of two stage ac voltage regulator with out put waveforms for RL load. **[8]**

b) A 3 phase full converter, fed from three phase, 400 V, 50 Hz source is connected to load R = 10Ω , E = 350 V and large inductance so that the output current is ripple free. Calculate the power delivered to load and input power factor for $\alpha = 30°$ **[8]**

Q7) a) For single pulse width modulation with quasi square wave show that output voltage can be expressed as $V0 = \sum_{n=1,3,5,...}^{\infty} \frac{4Vs}{n\pi} \sin \frac{n\pi}{2} \sin nd \sin n wt$. Where Vs is source voltage and pulse width is 2d. **[8]**

b) Explain with neat circuit diagram working of single phase full bridge voltage source inverter connected to R, RL, RLC load and draw output voltage and current waveforms. **[8]**

OR

Q8) a) Explain Multiple pulse modulation with necessary waveforms. Why multiple pulse modulation is better than single pulse modulation? **[8]**

b) Compare current source inverter and voltage source inverter. **[8]**

Q9) a) Draw neat diagram of three level Flying capacitor converter and explain its principal of operation. Comment on voltage balancing of capacitors. **[10]**

b) List different harmonic elimination techniques used in inverter. Explain any one method in detail. **[8]**

OR

Q10) a) Explain working of three phase six step voltage source inverter in 120° mode of operation. For star connected load draw output voltage waveforms. Show devices conducting in each step. **[10]**

b) Write short note on cascaded multilevel converter. **[8]**

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