

Total No. of Questions : 10]

SEAT No. :

P1734

[Total No. of Pages : 3

[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 $V_s = 230 \text{ V}$, load resistance $R = 10 \Omega$. 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 $R = 10 \Omega$, $E = 350 \text{ V}$ and large inductance so that the output current is ripple free. Calculate the power delivered to load and input power factor for $\alpha = 30^\circ$ [8]

Q7) a) For single pulse width modulation with quasi square wave show that output

voltage can be expressed as
$$V_0 = \sum_{n=1,3,5,\dots}^{\infty} \frac{4V_s}{n\pi} \sin \frac{n\pi}{2} \sin n\alpha \sin n\omega t$$

Where V_s is source voltage and pulse width is 2α . [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]

