

Total No. of Questions : 8]

SEAT No. :

**P2860**

**[4958]-1048**

[Total No. of Pages : 3

**T.E.(E&TC Engineering)**

**POWER ELECTRONICS**

**(2012Pattern) (Semester-II) (End Sem)**

*Time :2½Hours]*

*[Max. Marks : 70*

*Instructions to the candidates:*

- 1) *Answer Q.1 or Q.2,Q.3or Q. 4, Q.5 or Q. 6 , Q .7 or Q. 8.*
- 2) *Neat diagrams and waveforms must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of nonprogrammable calculator is allowed.*
- 5) *Assume suitable data, if necessary.*

- Q1)** a) Draw & Explain a gate drive circuit for IGBT. [7]
- b) Draw & explain single phase half controlled rectifier(semi converter) for R-L load with o/p voltage & current waveforms. What is inherent free wheeling in semi converter for R-L load. [7]
- c) Single phase full bridge inverter is operated from 50V dc supply, it has a resistive load of  $R= 5\Omega$  . Find: [6]
- i) rms o/p voltage at fundamental frequency( $V_{o1}$ )
  - ii) rms o/p power
  - iii) rms o/p Voltages at second & third harmonic( $V_{o2}$ & $V_{o3}$ )

OR

- Q2)** a) Compare SCR with MOSFET [7]
- b) What are PWM techniques in inverter? Explain Multiple PWM technique with waveforms. [6]
- c) Draw & explain three phase half controlled bridge converter for R load with o/p voltage waveforms. [7]

**P.T.O.**

- Q3)** a) Explain operation of step down chopper with R load and derive expressions for average output voltage & rms output voltage. [8]
- b) Explain operation of step up chopper with circuit diagram and derive an expression for its o/p voltage:  $V_o = \frac{V_s}{(1-D)}$  where D is duty cycle. [6]
- c) A step down DC chopper has a resistive load of  $R=15\Omega$  and input voltage  $E_{dc}=200V$ . When the chopper remains ON, its voltage drop is 2.5V. The chopper frequency is 1KHz. If the duty cycle is 50%, determine
- Average output voltage [4]
  - rms output voltage

OR

- Q4)** a) A step up chopper is used to deliver load voltage is 660V from 220V DC source. If the blocking period of thyristor is 500  $\mu s$ , compute the turn on time. [5]
- b) A single phase full wave ac voltage controller has a resistive load of  $R=10\Omega$  and the input voltage is  $V_s=230V(\text{rms}), 50 \text{ Hz}$ . The delay angles of thyristors T1 and T2 are equal:  $\alpha_1 = \alpha_2 = \pi/3$ . Determine [5]
- the rms output voltage
  - the rms output current
- c) Draw & explain single phase full wave ac voltage controller has a resistive load with following waveforms: [8]
- Gate signals for T1 and T2
  - o/p rms voltage & current
  - Voltage across T1

- Q5)** a) Explain various modes of operation in DC motor with neat diagrams. [8]
- b) Explain operation of On-line & off-line UPS with block schematic. [8]

OR

- Q6)** a) Explain stepper motor drives. [8]
- b) What are advantages of electronic ballast over conventional ballast? Explain working of electronic ballast with block schematic. [8]

- Q7)** a) What are different over voltage protection techniques in power electronics? Explain any one in with circuit diagram. [8]
- b) What is EMI? Explain various sources & minimizing techniques of EMI. [8]

OR

- Q8)** a) Explain the role of heat sink. [4]
- b) What is the need of resonant converter? Explain ZCS resonant converter with circuit & waveforms. [8]
- c) For a thyristor, Maximum junction temperature is  $110^{\circ}\text{C}$ . The thermal resistances are  $\phi_{JC} = 0.16$ ,  $\phi_{CS} = 0.08^{\circ}\text{C/W}$ . for heat sink temperature of  $60^{\circ}\text{C}$ , calculate total average power loss in thyristor-sink combination. If heat sink temperature is reduced to  $50^{\circ}\text{C}$ , find new total average power loss in thyristor - sink combination. [4]

