

Total No. of Questions : 8]

SEAT No. :

PC-1781

[Total No. of Pages : 3

[6353] - 100

**T.E. (E& TC Engineering
Power Devices & Circuits**

(2019 Pattern) (Semester - II) (304194)

Time : 2½ Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8*
- 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) Explain working of single phase half bridge inverter (using MOSFET / IGBT) for R-L load with input & output waveforms. [7]
- b) 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 voltages at third & fifth harmonic (V_{o3} & V_{o5})
 - ii) Distortion factor (DF) of 3rd harmonic component
 - iii) Total harmonic distortion (THD)
- c) Distinguish between freewheeling diode with feedback diode [4]

OR

- Q2)** a) What is mean by harmonics in inverters? Explain effects of harmonics.[5]
- b) Draw a three phase inverter for balanced star R load? Explain its operation of 180° mode with gate signals & output waveforms. [12]

P.T.O.

- Q3)** a) Explain working of step down chopper for R load and derive an expression for its average o/p voltage? [6]
- b) Explain with block schematic working of SMPS. [6]
- c) A step down chopper is operated from dc supply voltage of 230V. It has resistive load with $R = 10\Omega$. If duty cycle is 40%, calculate: [6]
- i) Average & rms o/p volages ii) Average & rms o/p currents
iii) Chopper efficiency

OR

- Q4)** a) A step up chopper is operated from 220V dc supply and it provides 550V output. If chopping frequency is 1KHz, calculate ON & Off times of chopper. [4]
- b) What are various types of choppers? Explain operation of two quadrant chopper with circuit diagram [8]
- c) Draw circuit diagram of step up chopper and distinguish between step up & step down choppers [6]
- Q5)** a) What are different over voltage protection techniques in power electronics? Explain any one in detail. [7]
- b) Why isolation is required in power electronic circuits? Explain with neat diagram working of isolation transformer. [6]
- c) For a thyristor, Maximum junction temperature is 150°C . The thermal resistances are $\theta_{jc} = 0.16^{\circ}\text{C/W}$, $\theta_{cs} = 0.08^{\circ}\text{C/W}$. for heat sink temperature of 60°C , calculate total average power loss in thyristor - sink combination. If heat sink temperature is reduced to 60°C , find new total average power loss in thyristor - sink combination. [4]

OR

- Q6)** a) What is resonant converter? What are its various types? Explain any one resonant converter with circuit & waveforms. [8]
- b) What is EMI? Explain various sources & minimizing techniques of EMI. [5]
- c) Explain the role of heat sink in power electronic circuits with its thermal equivalent circuit [4]

Q7) a) Explain with circuit diagram single phase full wave AC voltage controller for R-load. Also draw following waveforms? [7]

- i) Input voltage
- ii) Gate signals for power devices
- iii) Output voltage
- iv) Output current

b) What is UPS? Explain operation of Off-line UPS with block schematic. [6]

c) Explain with suitable circuit diagram working of a LED driver [5]

OR

Q8) a) Explain various performance parameters of batteries used in battery operated power systems. [6]

b) Explain with diagram architecture of EVs battery charger [6]

c) Explain working of electronic ballast with block schematic. [6]

