

Total No. of Questions : 8]

SEAT No. :

P-7599

[Total No. of Pages : 3

[6180]-116
T.E. (E & TC)
POWER DEVICES AND 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 and 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]**

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 voltages
- ii) Average & rms o/p currents
- iii) Chopper efficiency

P.T.O.

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 50°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]

