

Total No. of Questions : 8]

SEAT No. :

P319

[Total No. of Pages : 3

[6003]-400

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 Q.1 or Q.2, Q.3 or 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) How feedback diodes differ from freewheeling diodes **[4]**

b) Explain working of single phase full bridge inverter (using MOSFET/ IGBT) for R -L load with input & output waveforms. **[7]**

c) Single phase full bridge inverter is operated from 100V dc supply, it has a resistive load of $R = 10 \Omega$. Find: **[6]**

i) rms o/p voltages at third & fifth harmonic (V_{03} & V_{05})

ii) Distortion factor (DF) of 3rd harmonic component

iii) Total harmonic distortion (THD)

OR

Q2) a) What are PWM techniques in inverter? Explain any one PWM technique with waveform. **[5]**

b) Draw a three phase inverter for balanced star R load? Explain its operation of 120° mode with gate signals & output waveforms. **[12]**

P.T.O.

- Q3) a)** Explain with block schematic working of SMPS. [6]
- b) A step down chopper is operated from dc supply voltage of 230 V. It has resistive load with $R = 10 \Omega$. When chopper operates, voltage drop across chopper is 2V. If duty cycle is 40%, Calculate:
- Average & rms o/p voltages
 - Average & rms o/p currents
 - Chopper efficiency.
- c) Explain with diagrams various control techniques in DC chopper operation. [6]

OR

- Q4) a)** Explain with circuit diagram operation of step up chopper and derive an expression for its o/p voltage : $V_o = \frac{V_s}{(1-D)}$ where D is duty cycle. [8]
- b) Explain operation of four quadrant chopper with circuit diagram. [6]
- c) A step up chopper is operated from 200 V dc supply and it provides 360 V output. If chopping frequency is 5KHz, calculate ON & Off times of chopper. [4]
- Q5) a)** What are different over current 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 180°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 70°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 the need of resonant converter? Explain ZVS resonant converter with circuit & waveforms. [8]
- b) Why heatsink is used in power electronic circuits? Draw its thermal equivalent circuit. [4]
- c) What are various EMC standards? Explain any two. [5]
- Q7)** a) What is UPS? What are its types? Explain operation of any one UPS with block schematic. [7]
- b) Explain working of electronic ballast with block schematic. [6]
- c) Why driver is required for LED lamp? Explain with suitable circuit diagram working of a LED lamp drive. [5]

OR

- Q8)** a) Explain single phase full converter drive for single phase separately excited dc motor. [6]
- b) Explain with neat diagram BLDC drive. [6]
- c) Explain various performance parameters of batteries used in battery operated power systems. [6]

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