Total No. of Questions : 8]

SEAT No. :

PE-2565

[Total No. of Pages : 3

[6583]-94
T.E. (E&TC Engineering)
POWER DEVICES & CIRCUITS
(2019 Pattern) (Semester - VI) (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) Single phase full bridge inverter is operated from 120V dc supply, it has a resistive load of R = 20 Ω. 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)

b) Give classification of inverters? Explain role of feedback diodes in inverters. **[4]**

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

OR

Q2) a) Draw a three phase inverter for balanced star R load? Explain its operation of 180° mode with gate signals & output waveforms. **[11]**

b) What are advantages of PWM techniques in inverter? Explain Multiple PWM technique with waveforms. **[6]**

Q3) a) A step down chopper is operated from dc supply voltage of 200V. It has resistive load with R=20 Ω. When chopper operates, voltage drop across chopper is 2V. If duty cycle is 50%, calculate : **[6]**

i) Average & rms o/p voltages

ii) Average & rms o/p currents

iii) Chopper efficiency

b) Explain with diagrams various control techniques in DC chopper operation. **[6]**

c) Explain with block schematic working of SMPS. **[6]**

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OR

Q4) a) A step up chopper is operated from 230V dc supply and it provides 500V output. If chopping frequency is 2KHz, calculate ON & Off times of chopper. **[4]**

b) Explain with circuit diagram operation of step up chopper and derive an expression for its o/p voltage : $Vo = \frac{Vs}{(1-D)}$ where D is duty cycle. **[8]**

c) Explain operation of step down chopper with R-L load for continuous & discontinuous current mode. **[6]**

Q5) a) What is snubber circuit? Explain with circuit diagram working of snubber circuit. **[6]**

b) Why isolation is required in power electronic circuits? Explain with neat diagram working of isolation transformer. **[7]**

c) For a thyristor, Maximum junction temperature is 200°C. The thermal resistances are $\varnothing_{JC}$ = 0.16°C/W, $\varnothing_{CS}$ = 0.08°C/W. For heat sink temperature of 90°C, calculate total average power loss in thryistor - sink combination.

If heat sink temperature is reduced to 70°C, find new total average power loss in thryistor - sink combination **[4]**

OR

Q6) a) What is the need of resonant converter? Explain ZCS resonant converter with circuit & waveforms. **[7]**

b) What are various cooling techniques used in power electronic circuits? Explain in brief any one with thermal equivalent. **[4]**

c) What is EMI? What are various sources? Explain minimizing techniques of EMI. **[6]**

Q7) a) Explain with circuit diagram & various waveforms, how single phase full wave AC voltage controller is used as a fan regulator. **[6]**

b) Explain various battery charging models for EVs **[6]**

c) Explain operation of On-line UPS with block schematic. **[6]**

OR

Q8) a) Explain single phase semi converter drive for single phase separately excited dc motor. **[6]**

b) Why driver is required for LED lamp? Explain with suitable circuit diagram working of a LED lamp driver. **[5]**

c) Explain with neat diagram variable voltage / frequency three phase induction motor drive. **[7]**