Total No. of Questions : 8] **SEAT No. :**

P766 **[Total No. of Pages : 2**

[5870]-1071

T.E. (E & TC Engineering)

POWER DEVICES & CIRCUITS

(2019 Pattern) (Semester - II)

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 wave forms 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) What are PWM techniques in inverter? Explain Multiple PWM technique with waveforms. **[5]**

b) Give the classification of inverters?Draw Three Phase voltage source inverter for balanced star R load? **[5]**

c) Explain working of single phase full bridge inverter for R load with input & output waveforms. Derive an expression for rms o/p voltage. **[7]**

OR

Q2) a) Draw a three phase inverter for balanced star R load? Explain its operation of 120° mode with gate signals & output waveforms. **[12]**

b) What is mean by harmonics in inverters? Explain effects of harmonics.**[5]**

Q3) a) Explain with neat diagram the operation of 4 quadrant chopper with dc motor as a load. **[8]**

b) Explain operation of step up chopper with circuit diagram and derive an expression for its o/p voltage : $Vo = \frac{Vs}{(1-D)}$ where D is duty cycle.**[6]**

c) A step down DC chopper has a resistive load of R = 15 Ω and input voltage Edc = 200V. The chopper frequency is 1KHz. If the duty cycle is 50%, determine **[4]**

i) Average output voltage

ii) rms output voltage

P.T.O.

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 500μs, compute the turn on time. **[4]**

b) What are various types of choppers? Explain operation of type C chopper with circuit diagram. **[8]**

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

Q5) a) What are different over voltage protection techniques in power electronics? Explain any one in detail. **[7]**

b) Explain ZCS resonant converter with circuit & waveforms. **[6]**

c) For a thyristor, Maximum junction temperature is 110°C. The thermal resistances are $\varnothing_{JC}$ = 0.16, $\varnothing_{CS}$ = 0.08°C/W. For heat sink temparature of 60°C, calculate total average power loss in thryistor - 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 EMI? Explain various sources & minimizing techniques of EMI. **[7]**

b) Compare resonant converters: ZVS with ZCS. **[5]**

c) Explain with neat diagram working of snubber circuit used in power devices. **[5]**

Q7) a) Explain with neat diagram BLDC drive. **[6]**

b) Explain operation of On-line & off-line UPS with block schematic. **[12]**

OR

Q8) a) Explain with neat diagram variable voltage type three phase induction motor drive. **[5]**

b) Explain with diagram architecture of EVs battery charger. **[5]**

c) Draw & explain single phase full wave ac voltage controller has a resistive load with following waveforms : **[8]**

i) Gate signals for both SCRs

ii) Output rms voltage & current

iii) Voltage waveform across first SCR

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