Total No. of Questions : 8]

SEAT No. :

P3365

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## T.E. (E & TC)

## POWER ELECTRONICS

## (2015 Pattern)

*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 must be drawn wherever necessary.***
3) ***Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.***
4) ***Assume Suitable data if necessary.***
5) ***Figures to the right indicate full marks.***

***Q1)*** a) Draw the construction of SCR and explain the operation using two transistor analogy with expression of anode current. **[7]**

b) Discuss the needs of series operation of SCR and explain the static and dynamic equalizing circuit. State its advantages and limitations. **[7]**

c) What are voltage control methods of Inverter? Explain any one technique. **[6]**

OR

***Q2)*** a) Draw steady state I-V characteristics of SCR. Explain the parameters $I_L, I_H, V_{BO}, V_{BR}$ & show them on the characteristics. **[7]**

b) Draw the construction of Power MOSFET and explain I-V steady state characteristics of Power MOSFET. Compare & contrast with SCR. **[7]**

c) Draw and explain single phase full converter with highly inductive load with input and output waveforms at 60 degC & 120 degC? **[6]**

***Q3)*** a) In DC chopper, average load current is 25 A, chopping frequency is 1kHz, $Vs = 220V$, Calculate ON and OFF period of chopper & duty cycle, if load resistance is 2 ohms, Draw waveforms with values of voltage, current & time? **[8]**

b) Draw and Explain Step Up chopper with circuit diagram and waveforms? Derive the expression of its output voltage? **[8]**

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OR

***Q4)*** a) Draw the circuit diagram & Explain working of single phase full wave ac voltage controller using IGBT with R load, Derive equation for rms output voltage? **[8]**

b) Draw the diagram & Explain the operation of step down SMPS? Draw the diagram showing implementation of this SMPS using PWM IC LM 3524? **[8]**

***Q5)*** a) What are resonant converters? Explain necessity of resonant converters. State its advantages. **[8]**

b) With the help of circuit diagram, Explain how overvoltage protection is achieved using Selenium diode and Metal oxide varistor? **[10]**

OR

***Q6)*** a) Explain with the neat diagram & waveforms L-type ZCS resonant converters? **[10]**

b) Explain need of heat sink & its design considerations to protect the power devices. A power device has a thermal resistance of 200°C/W. Calculate the maximum permissible power dissipation ,when the $T_{jmax}$ = 90 *degC* & $T_A$ = 25 *degC*. **[8]**

***Q7)*** a) With the help of block diagram, Explain the working of LED lamp driver circuit used for domestic lighting applications. **[8]**

b) What are the various types of UPS systems? With the help of block diagram, explain function of each block of on line UPS system. **[8]**

OR

***Q8)*** a) Calculate the back-up time in hour for a UPS with battery rating of 12 V, 150 AH capacity, Maximum input power rating is 800VA, actual power consumed by intercom system load is 300 watts at lagging power factor of 0.9. Assume efficiency of UPS is 85%. **[8]**

b) Draw and explain the operation fan regulator circuit using Triac with neat waveforms at various points? **[8]**

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