Total No. of Questions :12]

SEAT No. :

P4218

[Total No. of Pages : 4

[5459]-6
S.E. (E & TC/ Electronics)
POWER DEVICES & MACHINES
(2008 Pattern) (204185) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer three questions from section-I and three questions from section-II.***
2) ***Answer to the two sections should be written in separate answer books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Assume suitable data, if necessary.***

SECTION-I

Q1) a) Draw and explain reverse characteristics of power diode with mathematical analysis. **[9]**

b) Draw constitution diagram of IGBT and explain its switching characteristics. **[9]**

OR

Q2) a) Why UJT triggering is preffered? Draw and explain line synchronised UJT triggering circuit for S.C.R. **[9]**

b) The reverse recovery time of power diode is 5 μ sec and rate of fall of diode current is 80 A/μ sec. If softness factor is 0.5, determine **[9]**

i) t_a and t_b

ii) Peak inverse current (I_{RR})

iii) Storage charge (S_{RR})

Q3) a) Draw and explain two transistor analogy of SCR and derive an expression for anode currnet. **[8]**

b) Design UJT triggering circuit with the following UJT data: R_{BB}=5kΩ , n=0.72, I_p=0.6 MA V_p=18V, V_v=I_v=2.5 MA, normal leakage current=4.2 MA. Frequency of pulses is 2kHz, C=0–04μf. **[8]**

OR

P.T.O.

Q4) a) Explain different triggering modes of triac with proper later diagrams. With two modes are more sensitive. **[8]**

b) Describe following ratings as applicable to SCR **[8]**

i) Surge current rating

ii) I^2t rating

iii) $\frac{dv}{dt}$ rating

iv) $\frac{di}{dt}$ rating

Q5) a) Describe the working of single phase fully controlled bridge converter for R-L load in the following modes **[8]**

i) Rectifying mode

ii) Inversion mode

Also derive an expression for average output voltage.

b) Draw and explain single phase AC voltage controller for 'R' load with wave forms. Derive an expression for its output voltage. **[8]**

OR

Q6) a) A single phase semi converter is operated from 120 V, 50Hz and load resistance is $10\,\Omega$. IP the average output voltage is 25% of maximum possible average output voltage, calculate: **[8]**

i) Decay angle (α)

ii) RMS and average output current

b) Explain with neat diagram and wave forms the working of three phase AC voltage controller with resistive load. **[8]**

SECTION-II

Q7) a) Draw and explain step down chopper for 'R' load. Derive the expression for average and rms output voltages. **[9]**

b) A step down DC chopper has resistive load R=15 Ω and input voltage v_{dc}=200V. When chopper remains on its voltage drop is 2.5 V. The chopper frequency is 1kHz. IP duty cycle is 50% find: **[9]**

i) Average output voltage

ii) RMS output voltage

iii) Chopper efficiency

iv) Effective input resistance of chopper.

OR

Q8) a) With neat circuit diagram and necessary wave forms, explain the operation of single phase bridge Inverter with 'R' load. **[9]**

b) Single phase full bridge Inverter has resistive load of R=3 Ω and input voltage = 50V **[9]**

Calculate:

i) RMS output voltage at fundamental frequency

ii) Output power (Po)

iii) Average and peak currents of each thyristor

Q9) a) Explain torque-current and torque-speed characteristics of DC shunt motor. **[8]**

b) Derive an expression for torque of DC motor obtain condition-for maximum power. **[8]**

OR

Q10)a) Explain torque-speed characteristics of three phase Induction motor. **[8]**

b) Explain different methods of speed control of three phase induction motor. **[8]**

Q11)a) What is an auto transpower, explain its working with neat diagram. List its advantages and draw books. **[8]**

b) What is a stepper motor. Explain the working of stepper motor with neat diagram. **[8]**

OR

Q12)a) Explain construction, working of BLDC motor with the characteristics. **[8]**

b) Draw and explain various types of 3 phase transformer connection in details. **[8]**

❖ ❖ ❖