

Total No. of Questions : 12]

SEAT No. :

P6106

[Total No. of Pages : 3

[5559]-4

**S.E. (Electronics/E&TC) (Semester - I)**  
**POWER DEVICES & MACHINES**  
**(2008 Pattern)**

*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 construction diagram of IGBT and explain its switching characteristics. **[9]**

OR

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

b) The reverse recovery time of power diode is 5  $\mu$ sec and take of fall of diode current is 80A/ $\mu$  sec. If softness factor is 0.5, determine.

i)  $t_a$  and  $t_b$

ii) Peak Inverse current (IRR)

iii) Storage charge (SRR) **[9]**

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

b) Design UJT triggering circuit with the following UJT data:  $R_{BB} = 5K \Omega$ ,  $n = 0.72$ ,  $I_p = 0.6 \text{ MA}$ ,  $V_p = 18 \text{ V}$ ,  $V_v = 1 \text{ V}$ ,  $I_v = 2 - 5 \text{ MA}$ , Normal leakage current = 4.2 MA. frequency of pulses is 2 KHz,  $C = 0.04 \mu\text{f}$  **[8]**

**P.T.O.**

OR

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

b) Describe following ratings as applicable to SCR

i) Surge current rating                      ii)  $I^2t$  rating

iii)  $\frac{dv}{dt}$  rating                                  iv)  $\frac{di}{dt}$  rating [8]

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

i) Rectifying mode

ii) Inversion mode

Also derive an expression for average output voltage. [8]

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  $\Omega$ . If the average output voltage is 25% of maximum possible average output voltage, calculate:

i) Delay angle ( $\lambda$ )

ii) RMS and Average output current [8]

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  $R = 15 \Omega$  and input voltage  $V_{dc} = 200V$ . When chopper remains ON its voltage drop is 2.5 V. The chopper frequency is 1KHz. If 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  $R = 3 \Omega$  and input voltage = 50V calculate: [9]
- i) RMS output voltage at fundamental frequency
  - ii) Output power ( $P_o$ )
  - 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 transformer, explain its working with neat diagram. List its advantages and draw backs. [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]

