

Total No. of Questions : 12]

SEAT No. :

P4591

[Total No. of Pages : 3

[4957] - 165

Time : 3 Hours]

[Max. Marks :100

Instructions to the candidates:

- 1) *Answers to the two sections should be written in separate answer books.*
- 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.*

SECTION - I

- Q1)** a) Compare power MOSFET with BJT? [5]
b) Explain construction & steady state characteristics of power BJT. [7]
c) Explain reverse recovery characteristics of a power diode. [6]

OR

- Q2)** a) Compare power diode with schottky diode. [5]
b) Explain construction & steady state characteristics of power MOSFET. [7]
c) Draw and explain Gate Drive Circuit for IGBT. [6]

- Q3)** a) Explain construction & steady state characteristics of SCR. What is the effect of gate current? [10]
b) The gate triggering circuit of a SCR has a source voltage of 15V and the gate cathode characteristics has a straight line slope of 130. If gate power dissipation is 0.5W. calculate : [6]
i) Triggering voltage.
ii) Triggering current.
iii) Gate series resistance.

OR

P.T.O.

- Q4)** a) Explain construction & steady state characteristics of TRIAC with different modes of operation. [10]
 b) Draw & explain synchronized UJT triggering circuit for SCR with waveforms [6]
- Q5)** a) A single phase semi converter is operated from 120V, 50Hz AC supply. The load resistance is 10 Ω . If the average output voltage is 25% of the maximum possible average output voltage, determine: [6]
 i) Firing angle
 ii) Average output current
 iii) rms output current
 b) Draw single phase fully controlled rectifier for R-L load and explain its rectifier mode & inverter mode of operations with waveforms. Also derive expressions for average output voltage. [10]

OR

- Q6)** a) What are types of AC voltage controller? Draw & explain single phase full wave AC voltage controller for R load & derive an expression for its output voltage. Also draw the following waveforms : [10]
 i) gate pulses
 ii) output voltage
 iii) output current,
 iv) voltage across SCR1
 b) A single phase full wave ac voltage controller has a resistive load of $R = 10\Omega$ and the input voltage is $V_s = 120V(\text{rms}), 50 \text{ Hz}$. The delay angles of thyristors T1 and T2 are equal: $\alpha_1 = \alpha_2 = \pi/2$. Determine
 i) the rms output voltage & current [6]
 ii) the input PF

SECTION - II

- Q7)** a) Explain basic DC chopper with R load and derive expressions for average o/p voltage & rms o/p voltage. [10]
 b) Explain step up chopper and derive expressions for its average o/p voltage. [8]

OR

- Q8) a)** Explain I- Φ bridge inverter for R load with circuit & waveforms. Derive expression o/p rms voltage? [8]
- b) Single phase full bridge inverter has a resistive load of $R = 3\Omega$, dc input voltage is 48V. Calculate: [10]
- rms o/p voltage & current
 - rms o/p voltage at the fundamental frequency E_1
 - Output power P_o
 - rms o/p voltages at second (V_{o_2})
 - rms o/p voltages at third harmonic (V_{o_3})

- Q9) a)** Explain construction & working of a DC motor. [10]
- b) Explain torque-speed & torque-current characteristics for dc series motor. [6]

OR

- Q10)a)** Explain V/F control method for an induction motor. [8]
- b) Explain construction, working & characteristics of DC servomotor. [8]
- Q11)a)** State various protection methods for motors? Explain phase fail protection method for dc motor in detail. [8]
- b) Draw & explain various types of 3-phase transformer connection along with relation between phase & line voltages and currents. [8]

OR

- Q12)a)** Compare stepper motor with ordinary DC motor. [4]
- b) Explain construction, working & characteristics of BLDC motor. [8]
- c) Compare DC motor with BLDC motor. [4]

