UNIVERSITY OF PUNE
[4363-164]
T.E. (Electrical) Examination-2013
Power Electronics
(2008 pattern)

Time-Three hours **Maximum Marks-100**
[Total No. of Question=12] **[Total no. of printed pages= 2]**
Instructions:

(1)Answer 3 questions from Section-I. Answer question 3 from Section-II,
(2)Answers to the two sections should be written in separate answer books.
(3)Neat diagrams must be drawn whenever necessary.
(4)Figures to the right indicate full marks.
(5)Assume suitable data wherever necessary.

SECTION-I

Q.1 (a)With the help of two transistor Analogy, explain latching characteristics of SCR. (8)
(b)What are various SCR triggering method?Explain the UJT triggering circuit for SCR. (8)

OR

Q.2 (a)Compare GTO construction with SCR. How turn off through gate is achieved in GTO? (8)
(b)What protections are used for over voltage.over current & thermal protection in Power circuits? (8)

Q.3 (a)Draw neat circuit for a 3 Ø semibridge rectifier feeding R-L load.Write the output voltage expression .The range of control for continuous conduction of current. (8)
(b)Explain what is meant by inversion mode of operation of a converter?Draw the control characteristic for 1 Ø.rectifier showing Rectification & inversion mode of operation. (8)

OR

Q.4 (a)Describe the concept of overlap in 3Ø.Rectifier showing Rectification & inversion mode of operation. (8)

(b)Calculate output voltage & current for a single phase full converter feeding R-L load with R= 10Ω & L=15 mH from single phase 230V,50 Hz ac supply at $\alpha = 60^0$ with continuous conduction of current. (8)

Q.5 (a)How thyristorised ac regulator can be used as two stage voltage controller?(9)

(b)Explain working of triac as a fan regular using neat circuit diagram. (9)

OR

Q.6 (a)Explain 4 quadrant operation of TRIAC using neat diagram. (9)
(b)Explain working of single phase ac regular feeding resistive load.Derive output voltage equation. (9)

SECTION-II

Q.7 (a)Draw and explain transfer characteristics of MOSFET and explain the terms
(i)Pinch off voltage
(ii)Threshold voltage
(iii)Transconductance (8)

(b)What are the gate drive requirements of MOSFET and IGBT? (8)

OR

Q.8 (a)Draw and explain transfer characteristics and output characteristic of IGBT What is SOA? (8)
(b)Explain switching characteristic of MCT. (8)

Q.9 (a)Explain principle of operation of step down chopper.with neat diagrams explain TRC and CLC techniques. (10)
(b)A step up chopper has input voltage 220 V and output voltage 660V.If the off time of chopper is 100μ s,compute pulse width of output voltage .In case pulse width is halved for constant frequency operation,find the new output voltage.(6)

OR

Q.10 (a)Explain working of type A chopper feeding RL load with help of neat circuit diagram.Draw the output voltage and current waveforms. Derive expression for average output voltage. (8)
(b)What is "Duty Cycle Control" of a chopper? How PWM and FM control is used? Compare. (8)

Q.11 (a)Explain working of single phase transistorised bridge inverter to supply variable voltage variable frequency output. How frequency can be controlled? Draw output voltage and current waveforms for inductive load. (9)
(b)What are the techniques used for control of harmonics in output voltage of 3 phase inverter?Explain. (9)

OR

Q.12 (a)Explain working of 3 phase VSI in 180^0 mode.Draw all waveforms and equivalent ckts.,for star connected resistive load. (10)
(b)Explain working of single phase full bridge inverter.Draw all waveforms.(8)