

Total number of printed pages-4

53 (IE 602) PWEL

2019

POWER ELECTRONICS

Paper : IE 602

Full Marks : 100

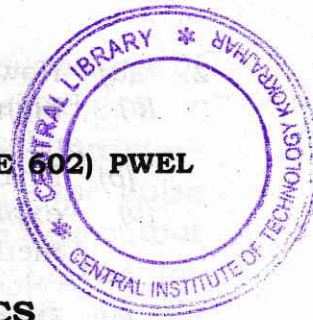
Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer **any five** questions.

1. (a) How IGBT differs from MOSFET and BJT? Give a comparison. 6
- (b) Draw the equivalent circuit of IGBT, SCR and MCT using BJT and MOSFET. 6
- (c) Draw the I-V characteristics of SCR and explain the terms — holding current, latching current, forward blocking region and forward breakover voltage. 8

Contd.



2. (a) How an SCR can be protected against high di/dt and high dv/dt ? 6
- (b) Draw the structure of a GTO and explain the turn on and turn off methods of GTO. 10
- (c) Draw the structure of TRIAC. Also draw its I-V characteristics. 4
3. (a) Explain the working of a half wave controlled rectifier with R-load. State what changes to its output will occur if the load is (i) RL (ii) RLC. 12
- (b) Obtain the expression for power factor for a bridge controlled rectifier using R-load. 8
4. (a) What is a chopper? What are the control strategies of a chopper? Explain each control strategy. 8
- (b) Draw the circuit diagram and derive the input-output voltage relation of—
 (i) Step down chopper
 (ii) Step up chopper
 (iii) Step up/Step down chopper. 12

5. (a) A step up chopper has input voltage of 220V and output voltage of 660V. If the conducting time of thyristor-chopper is $100\mu s$, compute the pulse width of output voltage. In case output voltage pulse width is halved for constant frequency operation, find the average value of new output voltage. 6
- (b) A type-A chopper has input dc voltage of 200V and a load of $R = 10\Omega$ in series with $L = 80mH$. If load current varies linearly between 12A and 16A, find the time ratio T_{on}/T_{off} for this chopper. 4
- (c) What is an inverter? Explain the working of a single phase bridge inverter. 10
6. (a) Give the steady state analysis of a single phase bridge inverter. Draw the output waveforms for R-load RL-load and RLC-load. 12
- (b) What is an SMPS? Explain any one configuration of SMPS. 8

7. (a) Explain the working of a short break and a no break UPS. 10
- (b) What is a cycloconverter? Explain the working of *any one* type of cycloconverter. 10

