

GUJARAT TECHNOLOGICAL UNIVERSITY**BE – SEMESTER- V EXAMINATION-SUMMER 2023****Subject Code: 3151106****Date: 26/06/2023****Subject Name: Power Electronics****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Simple and non-programmable scientific calculators are allowed.

- Q.1** (a) Explain the structure and symbol of SCR. **03**
(b) Draw and explain the class – B self-commutation of SCR using LC circuit. **04**
(c) Explain the working of half wave-controlled rectifier with resistive load. **07**
- Q.2** (a) Differentiate between one quadrant and two quadrant converter. **03**
(b) What is power MOSFET? Explain its output characteristics. **04**
(c) What is MOS controlled thyristor (MCT)? Explain turn on process of N-MCT. **07**
- OR**
- (c) Draw and explain the operation of fully controlled bridge circuit with RL load for single-phase controlled rectifier. **07**
- Q.3** (a) Explain the basic structure of IGBT. **03**
(b) Explain any one time ratio control (TRC) strategy for chopper operation. **04**
(c) What is DC chopper? Explain the principle of chopper operation. **07**
- OR**
- Q.3** (a) What is power integrated circuit (PIC)? **03**
(b) What is step-up chopper? Explain in brief. **04**
(c) Draw the circuit of Type B chopper and explain its operation with waveforms. **07**
- Q.4** (a) List the advantages and disadvantages of pulse width modulated (PWM) inverters. **03**
(b) A chopper circuit is operating on time ratio control (TRC) principal at a frequency of 2 kHz on a 220 V DC supply. If load voltage is 170 V, compute the conduction and blocking period of thyristor in each cycle. **04**
(c) What is inverter? Explain the operation of single-phase full bridge inverter. **07**
- OR**
- Q.4** (a) What are the drawbacks of square wave inverter? **03**
(b) Explain the single-phase, half-wave converter for controlling separately excited DC motor. **04**
(c) Explain the working of single phase current source inverter with resistive load. **07**
- Q.5** (a) Draw the characteristics of TRIAC. **03**
(b) Explain the block diagram of online UPS system. **04**
(c) Explain the operation of flyback converter (SMPS) with circuit diagram and waveform. **07**
- OR**
- Q.5** (a) Explain the chopper circuit used to drive DC series motor. **03**
(b) How to calculate capacity and efficiency of UPS battery? **04**
(c) What is resonant converter? Explain the working of series resonant inverter with unidirectional switch. **07**