

GUJARAT TECHNOLOGICAL UNIVERSITY
BACHELOR OF ENGINEERING – SEMESTER 4 – EXAMINATION – SUMMER 2026

Subject Code: 3142409

Date: 30/05/2026

Subject Name: Basic Power Electronics Devices, Circuits And Applications

Time: 10:30 AM TO 01:00 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)** Define power electronics and explain its interdisciplinary nature. **03**
 - (b)** Draw and Explain block diagram of Power Electronics System. **04**
 - (c)** Discuss characteristics of electrical energy and its storage. Also explain the need for energy conversion and power processing. **07**
- Q.2**
- (a)** Define reverse recovery time in power diodes. **03**
 - (b)** Explain significance of switching characteristics in diodes. **04**
 - (c)** Draw and explain the construction of power diode and explain its working. **07**
- OR**
- Q.2**
- (c)** Draw and explain Class C commutation of SCR. **07**
- Q.3**
- (a)** State full form of RCT, GTO and IGCT. **03**
 - (b)** Explain primary & secondary breakdown in transistors. **04**
 - (c)** List and explain in brief various Turn-ON methods of SCR. **07**
- OR**
- Q.3**
- (a)** Explain Gate triggering in SCR. **03**
 - (b)** Draw and explain the two-transistor model of SCR. **04**
 - (c)** Comment on series and parallel operations for power MOSFET. **07**
- Q.4**
- (a)** Define Power BJT and state its primary losses. **03**
 - (b)** Draw only, a neat labelled diagram showing switching characteristics of power MOSFET. **04**
 - (c)** Compare power BJT and power MOSFET. **07**
- OR**
- Q.4**
- (a)** State gate drive requirement of IGBT. **03**
 - (b)** State advantages of Wide-Bandgap MOSFETs over Si MOSFETs. **04**
 - (c)** Draw and explain basic structure of IGBT. Draw its VI characteristics and explain its operation in brief. **07**
- Q.5**
- (a)** Classify Power Electronics converters. **03**
 - (b)** List applications of Rectifier, Inverter, DC-DC converter and AC-AC converter. Explain in brief any one from each. **04**

(c) Create a block diagram showing integration of all protection devices in a modern power converter system. **07**

OR

- Q.5**
- (a)** Define dv/dt and di/dt protection in circuits. **03**
 - (b)** Illustrate typical snubber circuit and explain its function. **04**
 - (c)** Explain basic principle of operation of inverter and DC-DC converter. **07**
