

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

Subject Code: 3140915

Date: 06/06/2026

Subject Name: Power Electronics

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) Mention circuit symbol of MOSFET, UJT and TRIAC **03**
 - (b) Apply gate triggering of SCR using R-C triggering circuit to modify firing angle from 30° to 60° **04**
 - (c) Explain working of 1-phase full wave controlled rectifier with R-L load with free-wheeling diode with the help of circuit diagram and waveform. **07**
- Q.2**
- (a) Define isolated converter. Draw circuit diagram of fly-back converter. **03**
 - (b) Explain working of 1-phase full bridge inverter with the help of circuit diagram and waveform **04**
 - (c) With neat circuit diagram and waveform explain operation of Boost converter in continuous conduction mode. **07**
- OR
- Q.2**
- (c) With circuit diagram and waveform explain working of single phase cycloconverter with output frequency $1/5$ th of supply frequency. **07**
- Q.3**
- (a) State adverse effects of electromagnetic interference due to application of power electronic converters. **03**
 - (b) Mention working of SPWM modulation technique for varying output voltage of 1-phase full bridge inverter. **04**
 - (c) Explain three phase inverter with 120° mode of conduction with circuit and waveform **07**
- OR
- Q.3**
- (a) State causes and effects of harmonics developed with voltage and current of inverter output. **03**
 - (b) Mention working of SVPWM modulation technique to change output voltage of 1-phase inverter. **04**
 - (c) Explain working of three phase inverter with 180° mode of conduction with circuit and waveform **07**
- Q.4**
- (a) Derive formula of RMS voltage for the output of 1-phase half bridge controlled rectifier. **03**
 - (b) Apply suitable power electronic converter with bi-directional switches for single stage ac to ac conversion. **04**
 - (c) Describe three phase full-wave controlled AC –DC converter with R load with circuit and waveform **07**

OR

- Q.4**
- (a)** Derive formula of output voltage of step down chopper. **03**
 - (b)** Apply suitable power electronic converter for light dimmer control when light is supplied with ac source. **04**
 - (c)** Enlist seven applications of power electronic switch based inverter circuit in the domain of power system and electrical drives. **07**

- Q.5**
- (a)** Justify use of IGBT in DC-DC and DC-AC converter circuits. **03**
 - (b)** Compare operation of SCR with MOSFET on the basis of switching losses and conduction losses. Provide rationale for your answer. **04**
 - (c)** Apply chopper circuit for 4-quadrant operation with possible switching operations for operating in 2nd and 3rd quadrant. **07**

OR

- Q.5**
- (a)** Evaluate design steps for dV/dt protection of SCR. **03**
 - (b)** Compare construction of power diode with that of signal diode on the basis of constructional features, typical voltage and current ratings, switching speed and applications. **04**
 - (c)** Apply dual converter with three phase input to obtain variable positive and negative output voltages. **07**
