

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:3142409

Date:03-07-2024

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 SOA. Explain the concept of SOA of Power Semiconductor devices. **03**
 - (b) Compare ideal and practical Power Semiconductor Switches Devices. **04**
 - (c) Define Power Electronics System. Draw and Explain block diagram of Power Electronics System. **07**
- Q.2**
- (a) Draw the structure of Power Diode with proper nomenclature. Draw static V-I Characteristics and Switching Characteristics of Power Diode **03**
 - (b) Compare Linear and Power Electronics circuit. **04**
 - (c) Define Duty cycle. Explain the concept of duty cycle for control of DC-DC converter. **07**
- OR**
- (c) Define PWM. Explain the concept of PWM with necessary diagram. **07**
- Q.3**
- (a) List the different protection system required in Power Electronics Circuits. **03**
 - (b) Draw and Explain the Over Voltage protection for Power Electronics devices and circuits. **04**
 - (c) Explain the di/dt protection for power semiconductor switch with necessary diagram and equation. **07**
- OR**
- Q.3**
- (a) Explain the concept of EMI with reference to false triggering for power switches. **03**
 - (b) Draw and Explain the Over Current protection for Power Electronics devices and circuits. **04**
 - (c) Explain the dv/dt protection for power semiconductor switch with necessary diagram and equation. **07**
- Q.4**
- (a) Draw the symbol and construction of Schottky, Fast Recovery and Zener diode. **03**
 - (b) Explain the switching characteristics of Power Transistor with necessary diagram. **04**
 - (c) List the different Turn ON method and explain Gate Triggering with necessary diagram and equation. **07**
- OR**
- Q.4**
- (a) Draw the symbol and construction of DIAC, TRIAC and RCT. **03**
 - (b) Explain the two-transistor analogy of SCR using necessary diagram and equation. **04**
 - (c) List the different Turn OFF method and explain CLASS D Commutation Method with necessary diagram and equation. **07**
- Q.5**
- (a) Explain the concept and working of DC-DC converter for Power Electronics Circuits. **03**
 - (b) Explain the concept of Primary and Secondary breakdown in Power Transistor. **04**
 - (c) Draw and Explain Single Phase Controlled Rectifier with Resistive Load with necessary circuit diagram and waveform. **07**

OR

- Q.5** **(a)** Explain the concept and working of DC–AC converter for Power Electronics Circuits. **03**
- (b)** Explain the benefits of WBG material for Power Semiconductor Devices. **04**
- (c)** Draw and Explain AC - AC Converter with Resistive Load with necessary circuit diagram and waveform. **07**
