

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2023****Subject Code:3142409****Date:24-01-2024****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.

MARKS

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| Q.1 | (a) State the requirement of power processing in electrical engineering. | 03 |
| | (b) State and discuss the characteristics of electrical energy. | 04 |
| | (c) Draw block diagram of Power Electronics System. Compare Ideal and Practical switch. | 07 |
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| Q.2 | (a) Draw VI characteristics of power diode. | 03 |
| | (b) Differentiate between linear and power electronics. | 04 |
| | (c) Discuss the concept of safe operating area for power switches. Explain its significance. | 07 |
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| OR | | |
| | (c) State the principle of PWM and discuss its concept with a suitable example. | 07 |
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| Q.3 | (a) Classify power semiconductor diodes and state their applications. | 03 |
| | (b) Discuss the construction and characteristics of Schottky diode. | 04 |
| | (c) Write a technical note on Silicon Controlled Rectifier. | 07 |
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| OR | | |
| Q.3 | (a) Define a) Commutation of Thyristor b) Holding Current c) Latching Current. | 03 |
| | (b) Compare signal diode and power diode. | 04 |
| | (c) State and discuss in brief various protections for SCR. | 07 |
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| Q.4 | (a) Draw the structure of power transistor. | 03 |
| | (b) Discuss secondary breakdown in transistors. | 04 |
| | (c) Discuss series and parallel operation of power BJT. | 07 |
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| OR | | |
| Q.4 | (a) Draw only, a neat labelled figure showing the structure of power MOSFET. | 03 |
| | (b) State various current controlled and voltage-controlled devices. State the difference between them with respect to gate requirement. | 04 |
| | (c) Draw and explain the switching characteristics of IGBT. Also state the gate drive requirement for IGBT. | 07 |
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| Q.5 | (a) State the advantages and limitations of SiC MOSFET compared to Si MOSFET. | 03 |
| | (b) Compare Si devices with WBG devices. | 04 |
| | (c) Classify Power Electronics converters. State the principle of operation of Rectifiers, Inverters, DC-DC Converters and AC-AC converters. Also state its applications. | 07 |

OR

- Q.5**
- (a)** State full-form of EMI. Also state the requirement of EMI shielding. **03**
 - (b)** Discuss the requirement of thermal protection for power semiconductor devices. **04**
 - (c)** Discuss dv/dt , di/dt , OV and OC protection for power devices along with their need. **07**
