

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE- SEMESTER-IV (NEW) EXAMINATION – WINTER 2024****Subject Code: 3142409****Date: 27-11-2024****Subject Name: Basic Power Electronics Devices, Circuits And Applications****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.

|            |                                                                                                                                                   | <b>MARKS</b> |
|------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| <b>Q.1</b> | (a) State applications of power electronics.                                                                                                      | <b>03</b>    |
|            | (b) Give comparison between Linear Electronics and Power Electronics.                                                                             | <b>04</b>    |
|            | (c) Compare ideal switch and practical switch in tabular form.                                                                                    | <b>07</b>    |
| <b>Q.2</b> | (a) Draw structure of power diode & classify power diode.                                                                                         | <b>03</b>    |
|            | (b) Discuss i-v characteristics of power diode.                                                                                                   | <b>04</b>    |
|            | (c) Explain reverse recovery characteristics of power diode.                                                                                      | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                         |              |
|            | (c) Explain two transistor model of scr.                                                                                                          | <b>07</b>    |
| <b>Q.3</b> | (a) Discuss latching current and holding current in SCR.                                                                                          | <b>03</b>    |
|            | (b) Explain dv/dt and di/dt triggering methods of SCR.                                                                                            | <b>04</b>    |
|            | (c) Draw symbol and characteristics of TRIAC and explain operation of it.                                                                         | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                         |              |
| <b>Q.3</b> | (a) Enlist turn on methods of SCR.                                                                                                                | <b>03</b>    |
|            | (b) Explain the GTO in detail.                                                                                                                    | <b>04</b>    |
|            | (c) Draw symbol and characteristics of DIAC and explain operation of it.                                                                          | <b>07</b>    |
| <b>Q.4</b> | (a) Draw the switching characteristics of IGBT.                                                                                                   | <b>03</b>    |
|            | (b) Give Comparison between power-MOSFET & IGBT                                                                                                   | <b>04</b>    |
|            | (c) Draw and explain structure, symbol of Power BJT. Also explain the operation of NPN-type Power BJT in CE-mode and draw its V-I characteristics | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                         |              |
| <b>Q.4</b> | (a) Give classification of Power electronics converters.                                                                                          | <b>03</b>    |
|            | (b) State requirement of drive circuits for various power devices                                                                                 | <b>04</b>    |
|            | (c) Draw and explain basic structure, symbol and output characteristics of MOSFET.                                                                | <b>07</b>    |
| <b>Q.5</b> | (a) State application of various power electronics converters.                                                                                    | <b>03</b>    |
|            | (b) Write a short note on DC-AC Converters (Inverters).                                                                                           | <b>04</b>    |
|            | (c) Explain single phase Half wave uncontrolled rectifier.                                                                                        | <b>07</b>    |
|            | <b>OR</b>                                                                                                                                         |              |
| <b>Q.5</b> | (a) Explain the concept of PWM.                                                                                                                   | <b>03</b>    |
|            | (b) Why protection of semiconductor power switches is required?                                                                                   | <b>04</b>    |
|            | (c) Explain design and working principle of snubber circuit.                                                                                      | <b>07</b>    |

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