

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTECH  
BRANCH: ECE

SEMESTER : VI  
SESSION : SP/2025

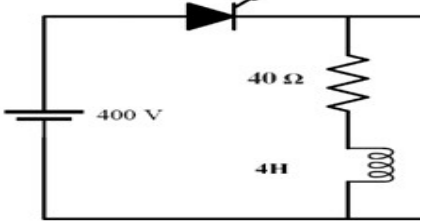
SUBJECT: EC375 INDUSTRIAL ELECTRONICS

TIME: 02 Hours

FULL MARKS: 25

INSTRUCTIONS:

1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
4. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates

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- |   |  | CO      | BL |
|---|--|---------|----|
| Q.1(a)  | Explain the different operating modes of an SCR with the help of V-I characteristics.  | [2] CO1 | 2  |
| Q.1(b)  | Sketch the two-transistor analogy of a SCR and derive the expression for the anode current in terms of common base current gain of the transistors, gate current and reverse saturation current through the transistors.   | [3] CO1 | 3  |
| Q.2(a)  | Differentiate between latching current and holding current of a SCR.   | [2] CO1 | 2  |
| Q.2(b)  | What are the different triggering methods used to bring SCR into conduction? Describe briefly each method.   | [3] CO1 | 2  |
| Q.3(a)  | Discuss briefly about the working, construction, V-I characteristics of DIAC, and TRIAC.   | [2] CO1 | 2  |
| Q.3(b)  | In the circuit shown below, the thyristor is gated with a pulse width of $50 \mu$ sec. The latching current of thyristor is 40 mA. For a load of 40 ohm and 4 H, will the thyristor get turned on? Check, if the answer is negative, how can this difficulty be overcome for a given load? | [3] CO1 | 3  |
|  |  |         |    |
| Q.4(a)  | Sketch the circuit diagram for single phase half wave-controlled rectifier with resistive and inductive (R-L) load considering a freewheeling diode. Explain the operation of this circuit with the necessary waveform for various voltages and currents.                                  | [2] CO2 | 2  |
| Q.4(b)  | The firing angle, $\alpha$ for a half-wave-controlled rectifier is $60^\circ$ . The load is purely resistive (R). Find (i) rectification efficiency, (ii) Ripple factor (RF), (iii) PIV for SCR  | [3] CO2 | 2  |
| Q.5(a)  | Sketch the circuit diagram for single phase fully controlled bridge rectifier with resistive and inductive (R-L) load. Explain the operation of this circuit with the necessary waveform for various voltages and currents.  | [2] CO2 | 2  |
| Q.5(b)  | Explain the operation of three phase half wave-controlled rectifier with resistive (R), loads. Provide necessary waveforms for various currents and voltages of the converter. Why does the minimum firing angle of the SCR has to be greater than $30^\circ$ in this circuit?             | [3] CO2 | 2  |