



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

| WINTER-2024                                 |                     |
|---|---------------------|
| Exam Seat No.:                              |                     |
| Academic Year:2024-2025                     | Semester:I          |
| Class:PG-I                                  | Program:M.Tech      |
| Branch Code:ELE                             | Pattern:2024        |
| Name of Course:Power Electronics Converters | Course Code:2406503 |
| Max. Marks:60                               | Duration:2.30 Hrs.  |

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 2 page(s).
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.

**Marks CO**

**Question No. 1**

- 1a) Draw and Explain the switching characteristics of SCR (6) CO 1

**Question No. 2**

- 2a) Explain the working of boost converter with neat waveform and also derive the expression for output voltage (6) CO 1, CO 2, CO 3

**Question No. 3**

- 3a) Explain the operation of sinusoidal pulse modulation of the inverter with a neat diagram. (8) CO 2
- 3b) With neat sketches, explain the operation of a three-phase voltage source inverter. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for  $120^\circ$  and the resistive load is star-connected. (8) CO 2, CO 3

**OR**

- 3c) Describe the working of a single-phase full bridge inverter supplying RL load with relevant circuit and waveforms (8) CO 2, CO 3
- 3d) With neat sketches, explain the operation of a three-phase voltage source inverter. Draw phase and line voltage waveforms, assuming that each thyristor conducts for  $180^\circ$  and the resistive load is star-connected (8) CO 2, CO 3

**Question No. 4**

- 4a) A single-phase full bridge converter is connected to R-load. The source voltage is 230 V, 50 Hz. The Average load current is of 10 A for  $R = 20 \text{ ohm}$ , Find the firing angle (8) CO 4
- 4b) Describe the working of a single-phase semi-converter with RL load and derive the output voltage. (8) CO 2, CO 3

**OR**

- 4c) A single-phase full converter is supplied from a 230 V, 50 Hz source. The load consists of  $R = 10 \text{ ohm}$  and a large inductance so as to render the load current constant. For a firing angle delay of  $30^\circ$ , determine (8) CO 4

1) Average output voltage

2) Average output current

3) Input power factor

- 4d) Explain the operation of a three-phase full-converter for a resistive load by drawing the output voltage waveform at 60 degrees (8) CO 3, CO 4

**Question No. 5**

- 5a) Describe the working of a single-phase AC voltage controller with R load and derive the output voltage. (8) CO 2, CO 3
- 5b) Draw and explain a single-phase AC voltage controller with RL load and derive the output voltage. (8) CO 2, CO 3

**OR**

- 5c) Draw and explain the half-wave AC voltage controller with RL Load and derive the output voltage. (8) CO 2, CO 3
- 5d) Describe the operation of a 3-phase thyristorized AC voltage controller with neat power diagram and waveforms (8) CO 2, CO 3

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