Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination May-2023

OE00003 Industrial Electronics

Programme: B.Tech. Branch/Specialisation: All

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Which of the following terminals does not belong to the MOSFET? **1**
(a) Drain (b) Gate (c) Base (d) Source

ii. The dv/dt protection is provided in order to- **1**
(a) Limit the power loss
(b) Reduce the junction temperature
(c) Avoid accidental turn-on of the device
(d) Avoiding sudden large voltage across the load

iii. The device that exhibits negative resistance region is: **1**
(a) Diac (b) Triac (c) Transistor (d) UJT

iv. In the process of diode-based rectification, the alternating input voltage is converted into- **1**
(a) An uncontrolled alternating output voltage
(b) An uncontrolled direct output voltage
(c) A controlled alternating output voltage
(d) A controlled direct output voltage

v. Choppers converts- **1**
(a) AC to DC (b) DC to AC
(c) DC to DC (d) AC to AC

vi. A type D chopper is a- **1**
(a) Two quadrant type-B chopper
(b) Two quadrant type-A chopper
(c) Two quadrant type-C chopper
(d) None of these

P.T.O.

vii. In a single-phase half wave inverter how many SCR(s) are/is gated at a time- **1**
(a) One (b) Two (c) Three (d) none of these

viii. Inverters converts- **1**
(a) DC power to DC power (b) DC power to AC power
(c) AC power to AC power (d) AC power to DC power

ix. A single-phase half wave voltage controller consists of- **1**
(a) One SCR is parallel with one diode
(b) One SCR is anti-parallel with one diode
(c) Two SCRs in parallel
(d) Two SCRs in anti-parallel

x. The single-phase mid-point type cyclo-converter uses _____ number of SCRs. **1**
(a) 4 (b) 8 (c) 6 (d) None of these

Q.2 i. Draw the two-transistor analogue of a thyristor. **2**

ii. What is latching current and holding current for a thyristor? **3**

iii. Explain the construction and working of a thyristor. Also draw the static VI characteristics of SCR. **5**

OR iv. Explain the term Delay time, Rise time and Spread time for an SCR. **5**

Q.3 Attempt any two:

i. What do you mean by commutation of SCR? Explain Class C and Class D Commutation method of SCR. **5**

ii. Explain the construction and working of UJT along with its VI characteristics and its applications. **5**

iii. Explain the working of a single-phase dual convertor with suitable circuit diagram and waveforms. **5**

Q.4 i. What is chopping period and duty cycle in a chopper? Enlist the various control strategies for varying duty cycle in a chopper. **2**

ii. Draw and explain the working of Class B chopper with suitable waveforms. **3**

iii. A DC chopper circuit connected to a 100 V DC source supplies an inductive load having 40mH in series with a resistance of 5 Ω. A freewheeling diode is placed across the load. The load current varies between the limits of 10 A and 12 A. Determine the time ratio of a chopper. **5**

OR iv. Explain the construction and working principle of Buck Boost convertor along with its advantages and its application. **5**

Q.5 Attempt any two:

i. Draw and explain the working of auxiliary commutated single-phase bridge inverter along with its voltage and current waveforms. **5**

ii. How PWM control method can be used to control the output voltage of an inverter? List different PWM techniques used in single phase inverter. **5**

iii. Compare CSI and VSI. Enlist their various industrial applications. **5**

Q.6 Attempt any two:

i. What is cyclo-converter? Describe the working of bridge type configuration of single phase to single phase cyclo-converter. **5**

ii. What is AC voltage controller? Discuss its industrial application along with its merits and demerits. **5**

iii. Explain working of single-phase full wave AC voltage controller with RL load along with waveforms. **5**

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Marking Scheme
OE00003 Industrial Electronics

Q1.

1. Which of the following terminals does not belong to the MOSFET? 1
   c) Base

2. The dv/dt protection is provided in order to 1
   c) avoid accidental turn-on of the device

3. The device that exhibits negative resistance region is: 1
   a) UJT

4. In the process of diode based rectification, the alternating input voltage is converted into 1
   b) an uncontrolled direct output voltage

5. Choppers converts 1

   c) DC to DC

6. A type D chopper is a 1
   a) two quadrant type-B chopper

7. In a single-phase half wave inverter how many SCR(s) are/is gated at a time 1
   a) one

8. Inverters converts 1
   b) dc power to ac power

9. A single-phase half wave voltage controller consists of 1

   b) one SCR is anti parallel with one diode

10. The single phase mid-point type cycloconverter uses _____ number of SCRs. 1
    a) 4

Q2

a. Draw the two transistor analogue of a thyristor. 2
b. What is latching current and holding current for a thyristor. 3
   Latching Current 1.5
   holding current 1.5

c. Explain the construction and working of a thyristor. Also draw the static VI characteristics of SCR 5

   Construction 1
   Working 2
   Characteristics 2

   OR

d. Explain the term Delay time, Rise time and Spread time for an SCR. 5
   Delay time 1
   Rise time 2
   Spread time 2

Q3.

a. What do you mean by commutation of SCR? Explain Class C and Class D Commutation method of SCR. 5

   Commutation of SCR 1
   Class C Method 2
   Class D Method 2

b. Explain the construction and working of UJT along with its VI characteristics and its applications. 5
   Construction 1
   Working of UJT 1
   VI characteristics 2

Applications. 1

c. Explain the working of a single phase dual convertor with suitable circuit diagram and waveforms. 5

Working 2
Circuit diagram 2
Waveforms . 1

Q4

a. What is chopping period and duty cycle in a chopper? Enlist the various control strategies for varying duty cycle in a chopper. 2

Chopping period .5
Duty cycle .5
List of various control strategies 1 2

b. Draw and explain the working of Class B chopper with suitable waveforms. 3

Construction 1
Working 1
Waveform 1

A dc chopper circuit connected to a 100 V DC source supplies an inductive load having 40mH in series with a resistance of 5 Ω. A freewheeling diode is placed across the load. The load current varies between the limits of 10 A and 12 A. Determine the time ratio of a chopper. 5

OR

c. Discuss the construction and working principle of Buck Boost convertor along with its advantages and its application 5

Construction 2
Working principle 2
Advantages and its application 1

Q5

a. Draw and explain the working of auxiliary commutated single phase bridge inverter along with its voltage and current waveforms. 5

Construction 2
Working 2
Waveform 1

b. How PWM control method can be used to control the output voltage of an inverter. List different PWM techniques used in single phase inverter. 5

Explanation 3
List of PWM techniques 2

c. Compare CSI and VSI. Enlist their various industrial applications. 5

CSI 2
VSI 2
Application 1

Q6

a. What is cycloconverter? Describe the working of bridge type configuration of single phase to single phase cycloconverter. 5

Explanation 2
Working of bridge type configuration of single phase to single phase cycloconverter. 3

b. What is AC voltage controller? Discuss its industrial application along with its merits and demerits. 5

AC voltage controller 3
Its industrial application 1
Its merits and demerits. 1

c. Explain working of single phase full wave ac voltage controller with RL load along with waveforms. 5

Working 3
Waveforms 2.

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