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(OR)

- 12 2 5 5

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B.Tech. DEGREE EXAMINATION, MAY 2023
Sixth Semester

18AUE411T – POWER ELECTRONICS FOR ELECTRIC VEHICLE APPLICATION
(For the candidates admitted from the academic year 2018-2019 to 2021-2022)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.
- (ii) **Part - B & Part - C** should be answered in answer booklet.

Time: 3 hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Marks	BL	CO	PO
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Answer ALL Questions

- | | | | | |
|--|---|---|---|---|
| 1. The three terminals of IGBT are | 1 | 1 | 1 | 1 |
| (A) Base, emitter and collector | | | | |
| (B) Gate, source and drain | | | | |
| (C) Gate, emitter and collector | | | | |
| (D) Base, source and drain | | | | |
| 2. The heat generated in high power semiconductor equipment are in range of | 1 | 1 | 1 | 1 |
| (A) 2000 W cm^{-2} | | | | |
| (B) 200 W cm^{-2} | | | | |
| (C) 20 W cm^{-2} | | | | |
| (D) 2 W cm^{-2} | | | | |
| 3. In case of a practical pn junction diode, the rise in the junction temperature | 1 | 1 | 1 | 1 |
| (A) Decreases the width of the depletion region | | | | |
| (B) Increases the barrier potential | | | | |
| (C) Increases the width of the depletion region | | | | |
| (D) Width of the depletion region increases but the barrier potential remains constant | | | | |
| 4. Which among the following devices is the most suited for high frequency applications? | 1 | 1 | 1 | 1 |
| (A) BJT | | | | |
| (B) IGBT | | | | |
| (C) MOSFET | | | | |
| (D) SCR | | | | |
| 5. Push pull converters utilizes | 1 | 1 | 2 | 2 |
| (A) 2 switches and 2 diodes | | | | |
| (B) 2 switches and 1 diode | | | | |
| (C) 1 switch and 2 diodes | | | | |
| (D) 1 switch and 1 diode | | | | |
| 6. The load voltage of a chopper can be controlled by varying | 1 | 1 | 2 | 2 |
| (A) Duty cycle | | | | |
| (B) Firing angle | | | | |
| (C) Reactor position | | | | |
| (D) Extinction angle | | | | |
| 7. A boost converter is a power converter with an | 1 | 1 | 2 | 2 |
| (A) Output voltage > input voltage | | | | |
| (B) Output voltage < input voltage | | | | |
| (C) Output voltage = input voltage | | | | |
| (D) All the above | | | | |

8. A step down chopper is also called as a
 (A) First quadrant chopper (B) Second quadrant chopper
 (C) Third quadrant chopper (D) Fourth quadrant chopper
9. In a 3 ϕ full converter using 6 switches gate circuit must provide
 (A) One firing pulse every 30° (B) One firing pulse every 90°
 (C) One firing pulse every 60° (D) Three firing pulse per cycle
10. Ripple factor of bridge full wave rectifier is
 (A) 1.414 (B) 1.212
 (C) 0.482 (D) 1.321
11. A uncontrolled rectifier uses _____
 (A) IGBT (B) MOSFET
 (C) BJT (D) Diode
12. A rectifier converts
 (A) AC to DC (B) DC to AC
 (C) AC to AC (D) DC to DC
13. In inverters, to make the supply voltage constant.
 (A) An inductor is placed in series with the load (B) Capacitor is connected in parallel to the load side
 (C) Capacitor is connected in parallel to the supply side (D) None of the mentioned
14. In pulse width modulation.
 (A) The output voltage is modulated (B) The input voltage is modulated
 (C) The gating pulses are modulated (D) Both the output and input voltages are modulated
15. In an inverter, if the fundamental output frequency is 50 Hz, then the frequency of the lowest order harmonic will be
 (A) 50 Hz (B) 150 Hz
 (C) 250 Hz (D) 350 Hz
16. Cascaded multilevel inverter uses multiple units of _____ connected in a series to produce high AC voltages.
 (A) H – bridge cells (B) E – bridge cells
 (C) M – bridge cells (D) None
17. The technical parameters to be considered while designing an electric motor.
 (A) Power to weight ratio (B) Torque – speed characteristics
 (C) Efficiency and robustness (D) All the above
18. Automotive alternators require a power electronic _____ for producing a constant voltage at the battery terminals by modulating field current.
 (A) SCR (B) Current regulator
 (C) Voltage regulator (D) Inverter

19. Which of the following are the types of BLDC motor?
 (A) Unipolar, bipolar (B) Unipolar, PWM
 (C) Bipolar, PWM (D) Synchronous, induction
20. Three point starter can be used for
 (A) Both shunt and compound motors (B) Shunt motor only
 (C) Series motor only (D) Compound motor only

PART – B (5 × 4 = 20 Marks)

Answer ANY FIVE Questions

- | Marks | BL | CO | PO |
|-------|----|----|----|
| 4 | 2 | 1 | 1 |
| 4 | 2 | 1 | 1 |
| 4 | 2 | 2 | 2 |
| 4 | 2 | 3 | 3 |
| 4 | 2 | 3 | 3 |
| 4 | 2 | 4 | 4 |
| 4 | 2 | 5 | 5 |
21. Write short notes on semiconductors and types.
22. Differentiate between N-type and P-type semiconductor.
23. What is chopper? Explain the switching characteristics.
24. Explain the working of single phase half wave rectifier.
25. What are filters? Explain the role of filters in a circuit.
26. Write short notes on pulse width modulation technique.
27. Draw and explain the torque Vs speed characteristics of induction motor.

PART – C (5 × 12 = 60 Marks)

Answer ALL Questions

- | Marks | BL | CO | PO |
|-------|----|----|----|
| 12 | 2 | 1 | 1 |
| 12 | 2 | 1 | 1 |
| 12 | 2 | 2 | 2 |
| 12 | 2 | 2 | 2 |
| 12 | 2 | 3 | 3 |
| 12 | 2 | 3 | 3 |
| 12 | 2 | 4 | 4 |
| 12 | 2 | 4 | 4 |
28. a. Explain the construction and working principle of NPN transistor.
- (OR)
- b. Describe the construction and working principle of MOSFET.
29. a. Explain in detail about the construction of push-pull converter.
- (OR)
- b. Compare buck and boost converter with the circuit and mode of operation.
30. a. Differentiate between controlled and uncontrolled rectifier with the help of circuit and output waveform.
- (OR)
- b. What is a rectifier? Explain the presence of filter circuit in a full wave rectifier.
31. a. Explain in detail about construction, working principle and characteristics of six pulse inverter.
- (OR)
- b. What do you mean by multilevel inverter? Explain about cascaded H-bridge type.