28. a.	Explain the operation of single phase full rectifier with relevant waveforms.	10	1	3	3
	(OR)				
b.	Explain the operation of three phase uncontrolled rectifier with relevant waveforms.	10	1	3	3
29. a.	Differentiate between current source and voltage source inverts.	10	1	4	4
	(OR)				
b.	What are inverters? Explain the operation of three phase inverters with relevant waveforms.	10	1	4	4
30. a.	Explain the working principle of BLDC.	10	1	5	5
	(OR)				
b.	Explain the working principle of PMSM.	10	1	5	5

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Reg. No.															

B.Tech. DEGREE EXAMINATION, NOVEMBER 2022
Sixth and Seventh Semester

18AUE411T – POWER ELECTRONICS FOR ELECTRIC VEHICLE APPLICATION
(For the candidates admitted from the academic year 2018-2019 to 2019-2020)

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** should be answered in answer booklet.

Time: 2½ Hours Max. Marks: 75

	Marks	BL	CO	PO

PART – A (25 × 1 = 25 Marks)
Answer **ALL** Questions

1. The arrow on the symbol of MOSFET indicates — 1 1 1 1
   (A) The directions of electrons (B) That is a N-channel MOSFET
   (C) That is a D-channel MOSFET (D) The direction of conventional current flow

2. The three terminals of the IGBT are — 1 1 1 1
   (A) Base, emitter and collector (B) Gate, emitter and collector
   (C) Gate, source and drain (D) Base, source and drain

3. The heat generated in high power semiconductor equipment are in range of — 1 1 1 1
   (A) 2000 Wcm^{-2} (B) 20 Wcm^{-2}
   (C) 200 Wcm^{-2} (D) 2 Wcm^{-2}

4. _____based inverters do not require self-commutation. — 1 1 1 1
   (A) IGBT (B) SCR
   (C) GTO (D) PMOSFET

5. In IGBT the P^+ layer connected to the collector terminal is called as the — 1 1 1 1
   (A) Drift layer (B) Body layer
   (C) Collector layer (D) Injection layer

6. What is the duty cycle of a chopper? — 1 1 2 1
   (A) T_{on}/T_{off} (B) T_{on}/T
   (C) T/T_{on} (D) $T_{off} \times T_{on}$

7. Find the expression for output voltage for a step up chopper, assume linear variation of load current and α as the duty cycle — 1 1 2 2
   (A) V_S (B) V_S/α
   (C) $V_S/(1-\infty)$ (D) $V_S/\sqrt{2}$

8. In constant frequency PWM scheme, _____is varied. — 1 1 2 2
   (A) V_S (B) T_{on}
   (C) T (D) f

9. In case of a constant frequency system, $T_{on}=(1/4)^T$. if the chopping frequency 2KHz, find the value of T_{off}. 1 1 2 2
(A) (1/8)ms (B) (3,8)ms
(C) (1/8)μs (D) (3/8)μs

10. Which type of commutation circuit does not work on no load? 1 1 2 2
(A) Voltage commutation (B) Current commutation
(C) Both A and B (D) None of the above

11. Calculate the circuit turn-off time for 3ϕ fully controlled rectifier if the firing angle is 110° and supply frequency is 50 Hz. 1 1 3 3
(A) 3.8 msec (B) 5.2 msec
(C) 9.3 msec (D) 8.7 msec

12. A rectifier converts 1 1 3 3
(A) AC to AC (B) DC to DC
(C) DC to AC (D) AC to DC

13. Ripple factor of bridge half wave rectifier is 1 1 3 3
(A) 1.414 (B) 1.212
(C) 0.482 (D) 1.321

14. For a single phase half wave rectifier, the rectifier efficiency is always constant and it is. 1 1 3 3
(A) $4/\pi^2$ (B) $8/\pi^2$
(C) $16/\pi$ (D) $2/\pi^2$

15. For a single phase half wave thyristor circuit with R load, the power delivered to the resistive load is 1 1 3 3
(A) (Average load voltage)×(average load current) (B) (RMS supply voltage)^2/R
(C) (RMS load voltage)^2/R (D) (Average load voltage)/R

16. In pulse width modulation 1 1 4 4
(A) The output voltage is modulated (B) The input voltage is modulated
(C) The gate pulses are modulated (D) All the above

17. In inverters, to make the supply voltage constant. 1 1 4 4
(A) An inductor is placed in series with the load (B) An inductor is placed in parallel to supply
(C) Capacitor is connected to parallel to the load side (D) Capacitor is connected in parallel to the supply

18. A three phase bridge inverter requires minimum of _____switching devices. 1 1 4 4
(A) 2 (B) 4
(C) 6 (D) 8

19. Increasing the number of pulses, _____ 1 1 4 4
(A) Reduces the output voltage (B) Reduces the inverter frequency amplitude
(C) Improves the inverter efficiency (D) All the above

20. In a VSI (Voltage Source Inverter) 1 1 4 4
(A) The internal impedance is negligible (B) The internal impedance is high
(C) No internal impedance (D) Impedance cannot calculated

21. Half wave converters are used for controlling DC motor of _____ 1 1 5 5
(A) Below 400W (B) 400W – 4000W
(C) More than 4000W (D) Any where

22. Induction motors are widely used in electric vehicle because of 1 1 5 5
(A) High efficiency (B) Good speed regulation
(C) Absence of commutators (D) All the above

23. Due to low inertia, BLDC motor have _____ 1 1 5 5
(A) Faster acceleration (B) Slower acceleration
(C) High cost (D) Low cost

24. Which are the advantages of BLDC motor? 1 1 5 5
(I) Low cost
(II) Simplicity
(III) Reliability
(IV) Good performance
(A) I, II, III and IV (B) I and II
(C) I, II and IV (D) I, III and IV

25. The HV DC bus voltage for electric vehicles is in range of 1 1 5 5
(A) 400V (B) 48V
(C) 200V (D) 100V

PART – B (5 × 10 = 50 Marks) Marks BL CO PO
Answer **ALL** Questions

26. a. Explain in detail about construction, working principle and characteristics of PN junction diode. 10 1 1 1

(OR)

b. Explain in detail about construction, working principle and characteristics of IGBT. 10 1 1 1

27. a. Explain the construction and working of push pull converter. 10 1 2 2

(OR)

b. Explain the construction and working of buck boost converter. 10 1 2 2