Reg. No.															

B.Tech. DEGREE EXAMINATION, MAY 2024

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)

Answer **ALL** Questions

	Marks	BL	CO	PO
1. A freewheeling diode is basically a diode connected across the (A) Capacitive load (B) Inductive load (C) Resistive load (D) All the above	1	1	1	1
2. IGBT and BJT both posses (A) Low ON state power losses (B) High ON-state power losses (C) Low switching losses (D) High input impedance	1	1	1	1
3. ____based inverters do not require self-commutation. (A) IGBT (B) GTO (C) PMOSFET (D) SCR	1	1	1	1
4. Which of the following terminals does not belong to the MOSFET? (A) Drain (B) Gale (C) Base (D) Source	1	1	1	1
5. Calculate the output voltage of the buck-boost converter if the supply voltage is 14V and duty cycle value is 0.8f. (A) 79.3 V (B) 45.5 V (C) 86.5 V (D) 54.7 V	1	2	2	2
6. In a buck converter. (A) Output DC voltage > input DC voltage (B) Output DC voltage < input DC voltage (C) Output DC voltage = input DC voltage (D) Both A and B	1	1	2	2
7. Design considerations of DC-DC converter essential for automotive applications. (A) Light weight and volume (B) Low electromagnetic interference (C) Low current ripple drawn from the battery (D) All the above	1	2	2	2

8. _____ with sinusoidal input currents and bidirectional flow can be realized by coupling a PWM rectifier and inverter to the DC link. 1 1 2 1
   (A) DC-AC converter (B) AC-DC converter
   (C) DC-DC converter (D) AC-AC converter

9. A push pull converter uses a _____ to change the voltage of a DC power supply. 1 1 3 1
   (A) Transformer (B) Battery
   (C) Starter (D) Rheostat

10. In a 3 phase full converter using six switches, gating circuit must provide 1 2 3 1
   (A) One firing pulse every 30° (B) One firing pulse every 90°
   (C) One firing pulse every 60° (D) Three firing pulses per cycle

11. Ripple factor of bridge full wave rectifier is _____ 1 2 3 1
   (A) 1.414 (B) 1.212
   (C) 0.482 (D) 1.321

12. In a voltage source inverter. 1 1 3 1
   (A) The internal impedance of the DC source is negligible (B) The internal impedance of the DC source is very high
   (C) The internal impedance of the AC source is negligible (D) The IGBTs are fired at 0 degrees

13. Switches used in current source inverters are _____ 1 1 4 1
   (A) Bipolar and unidirectional (B) Bipolar and bidirectional
   (C) Unipolar and unidirectional (D) Bidirectional

14. A single phase full bridge inverter has load R=2Ω and DC voltage source V_s=230V. Find the rms value of the fundamental load current. 1 2 4 2
   (A) 96A (B) 0A
   (C) 103.5A (D) 2248A

15. Cascaded multilevel inverter uses multiple units of _____ connected in a series to produce high AC voltages. 1 1 4 1
   (A) H – bridge cells (B) E – bridge cells
   (C) M - bridge cells (D) L – bridge cells

16. Half-wave converters are used for controlling DC motor of_____ 1 1 4 1
   (A) Below 400W (B) 400W – 4000W
   (C) More than 4000 W (D) Any where

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

18. Due to low inertia BLDC motors have _____ 1 1 5 1
   (A) Faster acceleration (B) Slower acceleration
   (C) High-cost (D) Low-cost

19.	A SRM on over-load runs as (A) DC motor (B) Induction motor (C) Hysteresis motor (D) None of the above	1	1	5	1
20.	Which of the relationship is correct in ferromagnetic motor? (A) $T\alpha(I_a)^2$ (B) $T\alpha V$ (C) $T\alpha I_a$ (D) $T2\alpha I_a$	1	2	5	1

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

		Marks	BL	CO	PO
21.	Differentiate between P type and N type semiconductor.	4	2	1	1
22.	Write short notes on semi-conductors through energy band diagram.	4	2	1	1
23.	Draw and explain the chopper operation.	4	2	2	2
24.	Explain about single phase center tapped rectifier.	4	2	3	1
25.	Differentiate between current and voltage source inverter.	4	2	4	1
26.	Classify the DC motor by their winding arrangement.	4	2	5	1
27.	Sketch the torque Vs speed characteristics of induction motor and explain the role of slip.	4	2	5	2

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

		Marks	BL	CO	PO
28. a.	Explain in detail about the construction, working and output characteristics of BJT.	12	3	1	1
	(OR)				
b.	Explain in detail about the construction, working and characteristics of IGBT.	12	3	1	1
29. a.	Explain in detail the mode of operation of push-pull converter.	12	2	2	1
	(OR)				
b.	How to vary the fixed DC voltage to variable DC output voltage? Design a circuit and explain the operation.	12	3	2	2
30. a.	Compare single phase half and full wave rectifier with the help of circuit diagram, switching modes and output waveform.	12	3	3	2
	(OR)				
b.	Explain in detail how to generate continuous DC output using six pulse switches.	12	3	3	1

31. a.	What do you mean by multilevel inverters? Explain about cascaded H-bridge type.	12	3	4	1
	(OR)				
b.	Construct a six pulse inverter and generate a switching pattern to operate it at 180° conduction.	12	4	4	2
32. a.	Explain the operation of BLDC motor with the help of circuit diagram.	12	3	5	1
	(OR)				
b.	Mention the speed control techniques of DC traction motor and explain them in detail.	12	3	5	2

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