Reg. No.															

Question Paper Code	13479

B.E. / B.Tech. - DEGREE EXAMINATIONS, APR / MAY 2025

Fifth Semester

Electrical and Electronics

20EEPC502 - POWER ELECTRONICS

Regulations - 2020

Duration: 3 Hours | Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

		Marks	K – Level	CO
1.	Which one is most suitable power device for high frequency greater than100 KHz switching application? (a) BJT (b) Power MOSFET (c) Schottky diode d) Microwave transistor	1	K1	CO1
2.	Which statement is true for latching current? (a) It is related to turn off process of the device. (b) It is related to conduction process of device. (c) It is related to turn on process of the device. (d) Both C and D	1	K1	CO1
3.	A single-phase full controlled converted with RL load is a (a) one quadrant converter (b) two quadrant converter (c) four quadrant converter (d) none of the above	1	K1	CO2
4.	The average output voltage of single phase full converter with RL load in continuous conduction mode is (a) (Vm/π)cosα (b) (2Vm/π)cosα (c) (Vm/π) (1+cosα) (d) (2Vm/π) (1+cosα)	1	K1	CO2
5	Which of the following are the essential design considerations of a DC-DC Converter for automotive applications? (a) Heavy Weight (b) More volume (c) Low electromagnetic interference (d) All of the above	1	K1	CO3
6.	A type C chopper is a combination of ___ (a) Class A and Class B (b) Class B and Class C (c) Class C and Class D (d) None of the mentioned.	1	K1	CO3
7.	In PWM techniques, what does the term "modulation index" refer to? (a) The ratio of the desired output frequency to the input frequency (b) The ratio of the peak output voltage to the DC input voltage (c) The ratio of average output voltage to peak output voltage (d) The ratio of switching frequency to fundamental frequency	1	K1	CO4
8.	The 120° mode operation of a three-phase inverter means: (a) Each switch is on for 60° (b) Each switch is on for 180° (c) Each switch is on for 120° (d) Each switch is off for 180°	1	K1	CO4
9.	Which control strategy is primarily used to improve the power factor in AC voltage controllers? (a) On-off control (b) Phase control (c) Amplitude control (d) Frequency control	1	K1	CO5
10.	What type of converter can convert both the voltage and frequency of an AC signal? (a) Matrix converter (b) AC voltage regulator (c) Chopper (d) Rectifier	1	K1	CO5

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11.	Draw the VI characteristics of SCR.	2	K1	CO1
12.	Distinguish between holding current and latching current of SCR.	2	K2	CO1
13.	Compare punch through and non-punch through IGBT.	2	K2	CO1
14.	What are the advantages of freewheeling diodes in a controlled in a controlled rectifier?	2	K1	CO2

15.	Write the expression for average voltage of single-phase semi-converters.		2	K1	CO2
16.	What is meant by phase controlled rectifier?		2	K1	CO2
17.	A step up chopper is operated with a duty ratio of 0.6 for a dc input of 100 V. Determine the output voltage for a load resistance R_L of 5 ohm.		2	K2	CO3
18.	What is meant by 'current limit control' of a chopper?		2	K1	CO3
19.	Discuss the significance of harmonic control in inverter design.		2	K2	CO4
20.	Identify two common PWM techniques used in voltage source inverters.		2	K1	CO4
21.	What is the principle of ON-OFF control of AC controller?		2	K1	CO5
22.	Why forced commutation needed for step up cyclo converter?		2	K1	CO5

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

23.	a)	Explain the construction, operation and characteristics of SCR with neat diagrams.	11	K2	CO1
		OR			
	b)	Discuss with neat diagrams the structure, operation and characteristics of IGBT.	11	K2	CO1
24.	a)	The full-wave three-phase controlled rectifier has a three-phase 415V, 50Hz source, and provides a 100A constant load current, Determine: (i) Average and RMS thyristor current (ii) RMS and fundamental line current	11	K2	CO2
		OR			
	b)	Interpret the operation of single-phase half controlled converter with RL load, with the help of circuit relevant waveforms.	11	K2	CO2
25.	a)	Draw the power circuit diagram of a buck regulator and derive the expressions for V_O, ripple current and voltage, L and C.	11	K2	CO3
		OR			
	b)	A step down DC Chopper has input voltage of a 230V with 10 Ohms load resistor connected, voltage drop across chopper is 2V when it is ON. For duty cycle of 0.5. Calculate (i) Average and RMS value of output voltage. (ii) Power delivered to load.	11	K2	CO3
26.	a)	Discuss the operation of three phase inverter in 180 degree mode with relevant circuit and waveforms.	11	K2	CO4
		OR			
	b)	Explain the operation of single phase full bridge inverter supplying R, RL loads with relevant circuit and waveforms.	11	K2	CO4
27.	a)	With the aid of circuit diagram and waveform explain the operation of single phase step down cycloconverter.	11	K2	CO5
		OR			
	b)	Describe the ON-OFF control with bidirectional converter circuit.	11	K2	CO5
28.	a) (i)	Explain the operation of online UPS.	6	K2	CO4
	(ii)	Briefly explain the space vector modulation.	5	K2	CO5
		OR			
	b) (i)	Write notes on harmonic control.	6	K2	CO4
	(ii)	Illustrate the three phase to three phase cycloconverter.	5	K2	CO5