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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S6 (R, S) / S4 (PT) (R,S) Examination June 2023 (2019 Scheme)

Course Code: EET306

Course Name: POWER ELECTRONICS

Max. Marks: 100 Duration: 3 Hours

Graph sheets may be provided to answer questions 13 and 15

PART A

Answer all questions, each carries 3 marks. Marks

1	Sketch the VI characteristics of SCR and explain the importance of latching current in turn on process of SCR.	(3)
2	Compare the characteristic features of MOSFET and IGBT.	(3)
3	Explain the advantage of freewheeling diode in halfwave converter, when the load is inductive in nature.	(3)
4	A single phase full bridge converter, connected to 230 V, 50Hz source is feeding a load having resistance R=10Ω with a large inductance that makes the load current ripple free and continuous. Calculate the average value of load current for a firing angle of 60°.	(3)
5	Explain the working of single phase full wave AC voltage controller with RL load with neat circuit diagram, output voltage and current waveform.	(3)
6	Sketch the circuit diagram and the output voltage waveform of a single phase half-bridge Voltage Source Inverters with R load and explain its working.	(3)
7	Derive the expression for output voltage of step up chopper in terms of input voltage and duty cycle.	(3)
8	Explain the current limit control in DC-DC converter circuits.	(3)
9	List the advantages of Electric Drives.	(3)
10	Explain the Regenerative braking control using chopper drives.	(3)

PART B

Answer one full question from each module, each carries 14 marks.

Module I

11	a)	Explain the switching characteristics of Power MOSFET with neat diagram	(5)
	b)	Illustrate the different turn on methods of SCR.	(9)

OR

12 a) Explain the Two transistor analogy of SCR with significant equation. List the importance of current gain factor in turn on process. (7)

b) Illustrate di/dt protection and dv/dt protection of SCR and explain its significance (7)

Module II

13 a) Draw the circuit diagram of three phase fully controlled converter with RLE load. Derive the output equation assuming continuous conduction, ripple free operation (6)

b) Sketch and compare the output voltage waveforms of three phase fully controlled converter with RLE load for firing angles i) $\alpha = 0^\circ$ and ii) $\alpha = 60^\circ$. Show the conducting devices in each firing angle. (8)

OR

14 a) Illustrate the working of single phase half controlled bridge rectifier with RLE load and derive the output voltage equation in discontinuous conduction mode. Sketch the output voltage and output current waveform. (10)

b) Compare the working of fully controlled converter and semi converter with voltage - firing angle plots. (4)

Module III

15 a) Illustrate the working of three phase bridge inverter with R load with 180° conduction mode. Sketch the corresponding phase voltage waveforms and line voltage waveforms (10)

b) List out the merits and demerits of 120° conduction mode over 180° mode inverter. (4)

OR

16 a) Explain the operation of single phase capacitor commutated inverter with relevant waveforms. (7)

b) Describe single pulse width modulation used in inverters (7)

Module IV

17 a) Explain the Two quadrant type class D chopper operation in different quadrants with relevant output voltage and output current waveforms. . (8)

b) Explain the pulse width modulation techniques in DC-DC converter. (6)

OR

18 a) Explain with neat circuit diagram and waveforms, the operation of Buck Regulator. Derive the expression for its output voltage. (9)

b) In a step down chopper the DC input voltage is 100V. The MOSFET switch is having a switching frequency of 2kHz. Find the duty cycle and average dc output voltage if the turn on period of switch is 0.2ms. (5)

Module V

19 Describe the speed control of DC motor in simultaneous and non-simultaneous conduction mode using single phase Dual Converter. (14)

OR

20 a) Explain the working of Four quadrant chopper drives with neat circuit diagram. (6)

b) Explain the stator voltage control of three phase induction motor drive. (8)

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