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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

Course Code: EE305

Course Name: POWER ELECTRONICS (EE)

Max. Marks: 100 Duration: 3 Hours

Graph sheets will be supplied.

PART A

Answer all questions, each carries 5 marks. Marks

1		Draw the circuit for two transistor analogy of silicon controlled rectifier and briefly describe the working.	(5)
2		Derive the expression for the output voltage of half wave controlled rectifier with R load.	(5)
3		Draw the input and output voltage waveforms of 3ø half controlled rectifier with R load for a firing angle of 30^0.	(5)
4		What are the different classifications of inverters?	(5)
5		Explain the terms modulation index and frequency modulation ratio related to pulse width modulation.	(5)
6		What are the control strategies for the regulation of output voltage in ac voltagecontrollers?	(5)
7		Explain time ratio control method to vary the output voltage in choppers.	(5)
8		Derive an expression for average output voltage in terms of input dc voltage and duty cycle for a step up chopper.	(5)

PART B

Answer any twofull questions, each carries10 marks.

9	a)	Derive the expression for resistance used for static voltage equalisation for a series connected string.	(5)
	b)	In a power circuit, 4 SCRs are to be connected in series in a string to handle 6kV and 1kA. The voltage and current ratings of SCRs are 1800V and 1000A and have a maximum difference in their blocking currents of 10mA. Difference in recovery charge is 10μC. Design a suitable equalizing circuit with figure.	(5)
10		A single phase semi converter delivers a constant load current I_O . Express its source current in Fourier Series and derive the expressions for displacement factor and current distortion factor.	(10)
11	a)	Explain the structure & principle of operation of IGBT.	(5)
	b)	Draw RC triggering circuit for SCR and explain with relevant wave forms.	(5)

PART C

Answer any two full questions, each carries10 marks.

12 Draw the circuit of 3 phase fully controlled rectifier with RLE load and explain the working for $\alpha=60^o$ with necessary waveforms. Derive the expression for output voltage. (10)

13 Explain the operation of 3 phase voltage source inverter with 180° mode of operation. (10)

14 Explain how two 3 phase full converters can be connected back to back to form a circulating current type of dual converter with the help of waveforms. (10)

PART D

Answer any two full questions, each carries 10 marks.

15 For a single phase voltage controller feeding a resistive load, describe the working with reference to source voltage, source current, output voltage and output current. (10)

16 Describe the working of four quadrant chopper with relevant circuit diagrams and its operation in all the four quadrants. (10)

17 Explain with circuit diagram and waveforms, the working of Buck regulator for continuous current mode. Obtain expressions for inductance and capacitance. (10)

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