

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**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 $3\phi$ half controlled rectifier with R load for a firing angle of $30^\circ$ .	(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 voltage controllers?	(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 carries 10 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 $10\mu\text{C}$ . 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 carries 10 marks.*

- 12 Draw the circuit of 3 phase fully controlled rectifier with RLE load and explain the working for  $\alpha=60^\circ$  with necessary waveforms. Derive the expression for output voltage. (10)
- 13 Explain the operation of 3 phase voltage source inverter with  $180^\circ$  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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