

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 3ϕ half controlled rectifier with R load for a firing angle of 30° . | (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.

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|----|---|------|
| 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° 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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