

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**FIFTH SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019**

**Course Code: EE305**

**Course Name: POWER ELECTRONICS**

Max. Marks: 100

Duration: 3 Hours

**Graph sheet may be supplied on demand**

**PART A**

*Answer all questions, each carries 5 marks.*

Marks

- |   |  |     |
|---|--|-----|
| 1 | Sketch the static VI characteristics of SCR and define latching current and holding current.   | (5) |
| 2 | Describe briefly the RC triggering circuit for SCR with a neat circuit diagram. With the help of a graph explain how firing angle control up to 180 degrees is obtained. | (5) |
| 3 | Explain the operation of three-phase dual converter with circulating current..   | (5) |
| 4 | Sketch the diagram and output voltage waveform of a single phase half bridge Voltage Source Inverter with R load and describe the working.                               | (5) |
| 5 | Define modulation index and Frequency modulation ratio.  | (5) |
| 6 | What are the control strategies for the regulation of output voltage in AC Voltage Controllers?  | (5) |
| 7 | Explain the different methods by which control of output voltage is obtained in Choppers.  | (5) |
| 8 | Derive the expression for the voltage gain in a Boost regulator.   | (5) |

**PART B**

*Answer any two full questions, each carries 10 marks.*

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|----|---|-----|
| 9  | a) Compare the characteristic features of MOSFET AND IGBT   | (4) |
|    | b) Give the structure and operation of TRIAC.   | (6) |
| 10 | a) Describe a single phase half controlled converter with RL load along with necessary circuit diagram and waveforms.                               | (4) |
|    | b) With neat circuit diagram explain the operation of a Single Phase Half Wave Rectifier with R, load. Sketch the shape of output voltage waveform. | (6) |
| 11 | a) Explain how di/dt and dv/dt protection is accomplished in SCR.   | (4) |

- b) A fully controlled full wave converter has a source of 240 V rms, 50 Hz and  $10\ \Omega$ , 50mH, 50V Emf opposing series load. The delay angle is  $45^\circ$ . Determine (6)
- a) Average output voltage and current.
  - b) Rms load voltage and Rms voltage across the RL part of the load.
  - c) The power absorbed by the 50V load back emf.

**PART C**

*Answer any twofull questions, each carries 10 marks.*

- 12 Sketch the circuit diagram and explain the working of a 3 phase full wave controlled rectifier with RLE load. Draw the output voltage waveforms corresponding to  $\alpha = 60^\circ$ ,  $\alpha = 90^\circ$  and  $\alpha = 150^\circ$  (10)
- 13 Draw the circuit and explain the  $180^\circ$  operation of a 3 phase bridge inverter with R load. Draw the phase voltage and line voltage waveforms. (10)
- 14 a) With necessary waveforms explain the working and four quadrant operation of a single phase circulating current type Dual converter. (5)
- b) Differentiate a Current source inverter from a Voltage source Inverter. (5)

**PART D**

*Answer any twofull questions, each carries 10 marks.*

- 15 Explain with relevant waveforms a Single phase AC voltage controller with RL load. (10)
- 16 How four-quadrant operation is achieved in a Type E Chopper? Explain with neat circuit diagram. (10)
- 17 a) What is meant by Pulse Width Modulation? Describe the various PWM techniques used in Voltage control of Inverters. (5)
- b) Explain Sequence control with R load. (5)

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