

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

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

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
V SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2018

**Course Code: EE305**

**Course Name: POWER ELECTRONICS**

Max. Marks: 100

Duration: 3 Hours

*Graph sheets may be supplied on demand*

**PART A**

*Answer all questions, each carries 5 marks.*

Marks

- |    |  |     |
|----|--|-----|
| 1. | Define holding current and latching current of SCR. Show these currents on the static IV characteristics of SCR.   | (5) |
| 2. | With the help of circuit diagram and waveform, explain the operation of RC triggering circuit for one thyristor.   | (5) |
| 3. | A three phase half wave converter is operated from 3-phase, 230 V, 50Hz supply with load resistance $R = 10\Omega$ . An average output voltage of 50% of the maximum possible output voltage is required. Determine i) the firing angle, ii) average and rms values of load current. | (5) |
| 4. | With the help of circuit diagram explain the working of current source inverter.   | (5) |
| 5. | What is pulse width modulation? List the various PWM techniques.   | (5) |
| 6. | Explain the principle of phase control in a single phase ac voltage controller.  | (5) |
| 7. | Draw the circuit of step up chopper and explain its working.   | (5) |
| 8. | For a type A chopper, dc source voltage is 230 V, load resistance $10\Omega$ , drop across the switch is 2V and duty cycle 0.4. Calculate average and RMS value of output voltage and chopper efficiency.  | (5) |

**PART B**

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

- |    |   |      |
|----|---|------|
| 9  | a) Discuss the condition which must be satisfied for turning on the SCR with a gate signal.   | (5)  |
|    | b) Explain the significance of $di/dt$ protection in thyristors and describe the method employed for improving the same.  | (5)  |
| 10 | With the help of circuit diagram explain the working of single phase fully controlled converter with RL load. Draw the waveform of output voltage with and without freewheeling diode and output current. | (10) |
| 11 | a) What are the steps to be employed to prevent the difficulties of parallel operation of thyristors?   | (4)  |

- b) With the help of circuit diagram explain the operation of single phase semi converter with RL load. Draw the waveform of input voltage, output voltage, load current and voltage across the thyristor. (6)

### PART C

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

- 12 a) With the help of circuit diagram explain the working of three phase fully controlled converter. (5)
- b) Sketch the waveform of input voltage, output voltage and output current of a three phase fully controlled converter with R load operating at  $\alpha = 30^\circ$ . (5)
- 13 a) Describe the working of a three phase voltage source inverter with an appropriate circuit diagram. (4)
- b) Draw the phase and line voltage waveform of the three phase voltage source inverter with star connected resistive load on the assumption that each IGBT conducts for  $180^\circ$  (6)
- 14 a) With the help of circuit diagram explain the working of single phase dual converter with circulating current mode. (5)
- b) Write Fourier series expression for the output voltage from the single phase half bridge and full bridge inverter and determine the equation for THD. (5)

### PART D

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

- 15 a) Explain with suitable diagram, the principle of voltage control with single pulse width modulation. (5)
- b) With the help of circuit diagram explain the working of single phase ac voltage controller with R load. (5)
- 16 a) A step up chopper has input voltage of 120V and output voltage of 360 V. If the conducting time of the thyristor chopper is  $100 \mu\text{s}$ , Compute the pulse width of output voltage (5)
- b) With the help of circuit diagram and waveform explain the operation of buck converter and derive the equation of output voltage. (5)
- 17 a) Describe how multiple pulse modulated wave can be generated from carrier and reference wave. (5)
- b) Explain the design procedure of filter circuit for a boost converter with continuous current mode (5)

\*\*\*\*