Register No.: …………………………..   Name: ……………………………………………………………

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

SIXTH SEMESTER B.TECH DEGREE EXAMINATION (R), MAY 2023

(2020 SCHEME)

Course Code: **20EET394**

Course Name: **ANALYSIS OF POWER ELECTRONIC CIRCUITS**

Max. Marks: **100**   **Duration: 3 Hours**

PART A
(Answer all questions. Each question carries 3 marks)

1. List out the characteristics of ideal and real switches.
2. Draw the VI characteristics of a switch which can be used for low to medium voltages and high frequency.
3. Describe the effect of using freewheeling diode in single phase semi converter with RLE load.
4. Plot the output voltage waveform of a single phase fully controlled rectifier with RL load in continuous conduction mode.
5. Explain sinusoidal pulse width modulation used in inverters.
6. What are the effects of dead time on the output of PWM inverters.
7. Write a short note on multiphase chopper.
8. What happens if you interchange the position of diode and switch in a Type A chopper?
9. What do you mean by PWM rectifiers and explain their classification?
10. List any three applications of ac voltage controllers.

PART B
(Answer one full question from each module, each question carries 14 marks)
MODULE I

11. Using suitable waveforms, explain the static and dynamic characteristics of IGBT.   (14)

OR

12. Explain any two driver circuits suitable for MOSFET and IGBT.   (14)

MODULE II

13.   a)   Explain the effect of source inductance on single phase fully controlled rectifier with suitable waveforms and equations.   (9)

       b)   Draw the DC equivalent circuit representing the effect of source inductance in single phase fully controlled rectifier with RLE load.   (5)

OR

14.   a)   Explain the operation of three phase converter with equal (9) number of controlled and uncontrolled devices connected to RLE load, for a triggering angle of 60°.

        b)   Find the input power factor of a three phase fully controlled (5) converter with a delay angle of 120°.

MODULE III

15. For a single phase full bridge inverter with a resistive load of R = 2.5Ω (14) and the DC input voltage is V_s= 50V. Determine the rms output voltage at the fundamental frequency V_{o1}, the output power P_o, the average and peak currents of each transistor and THD.

OR

16. What are multilevel inverters? Classify and explain the working of each (14) type of multilevel inverter.

MODULE IV

17.   a)   Draw and explain the working of a DC transformer which can (10) be used for speed two quadrant operation of motor. Also derive the expression for the output voltage.

        b)   Explain time ratio control of a DC-DC converter.   (4)

OR

18.   a)   Explain the different concepts in controlling the switches in a (7) DC - DC converter.

        b)   A step-up chopper has input voltage of 220 V and output (7) voltage of 660 V. If the conducting time of the IGBT based chopper is 100 µs, compute T_{off} width of the output voltage pulse.

MODULE V

19. (a)   Describe the hysteresis control used in current regulated PWM (7) source inverters.

     (b)   Explain the working of three phase AC voltage regulator.   (7)

OR

20. The three phase AC voltage controller supplies a star connected (14) resistive load of R = 10Ω and the line to line voltage is 208V, 60Hz. The delay angle is 60⁰. Determine the RMS output voltage, the RMS output current, the output power, the input VA and the input power factor.

****