

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  
ELECTRICAL AND ELECTRONICS ENGINEERING****(2020 SCHEME)****Course Code : 20EET306****Course Name: POWER ELECTRONICS****Max. Marks : 100****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. Compare power electronics versus signal electronics.
2. Give a brief description on wide band-gap power devices.
3. List the advantages of the phase-controlled rectifier over diode rectifier.
4. Explain with neat sketches, the working of single-phase semi-converter feeding RLE load.
5. Compare voltage source and current source inverters.
6. Define Total Harmonic Distortion.
7. Explain the concept of Pulse Width Modulation scheme in choppers.
8. Derive the expression for output voltage of boost converter.
9. Explain the block diagram of an electric drive.
10. What is regenerative braking control in drives.

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

11. a) Explain the two-transistor analogy of SCR (7)  
b) Draw and explain the switching characteristics of SCR (7)

**OR**

12. a) With neat diagrams explain the different types of isolation in gate drive for power electronics circuits (7)  
b) Explain the structure of IGBT with relevant diagrams. (7)

**MODULE II**

13. A single-phase full converter bridge is connected to RLE load. The source voltage is 230 V, 50 Hz. The average load current of 10 A is constant over the working range. For  $R= 0.4 \Omega$  and  $L= 2 \text{ mH}$ , compute: (14)

(a) Firing angle delay for  $E= 120 \text{ V}$ ,(b) Firing angle delay for  $E= -120 \text{ V}$ .

Indicate which source is delivering power to load in part (a) and (b). In case output current is assumed constant, find the input power factor for both parts (a) and (b).

**OR**

14. Draw the circuit of three phase fully controlled rectifier with RLE load (14) and explain the working for  $\alpha=60^\circ$  with necessary waveforms. Derive the expression for output voltage.

**MODULE III**

15. (a) Explain the working of AC Voltage Controller with R load. (8)  
b) With the help of neat circuit diagram explain the working of Current Source Inverter. (6)

**OR**

16. Explain the  $120^\circ$  conduction mode of a three-phase bridge inverter (14) with output voltage waveforms, indicating the devices conducting in each state.

**MODULE IV**

17. (a) Describe the working of four quadrant chopper with relevant circuit diagrams. (9)  
b) Explain working of a step-down chopper. (5)

**OR**

18. (a) With the help of circuit diagram and waveform explain the operation of buck converter and derive the equation of output voltage. (8)  
b) Briefly explain the current limit control in DC-DC converters. (6)

**MODULE V**

19. (a) Explain the speed control of single phase fully controlled converter fed DC motor drive. (10)  
b) Explain the classification of load torque in electric drives. (4)

**OR**

20. With suitable diagrams explain the different speed control methods for three phase induction motor. (14)

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