

Register No.: Name:

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIRST SEMESTER M.TECH DEGREE EXAMINATION (R), DECEMBER 2023**POWER SYSTEMS****(2021 Scheme)****Course Code: 21PS103****Course Name: Power Electronic Circuits****Max. Marks: 60****Duration: 3 Hours****PART A*****(Answer all questions. Each question carries 3 marks)***

1. A single-phase semi converter is operated from 120V, 50 Hz AC supply. The load resistance is 10Ω . If the average output voltage is 25% of the maximum possible average output voltage, determine the firing angle and the rms and average output current.
2. Derive and prove that $\alpha_1 + \alpha_2 = 180^\circ$ for a dual converter.
3. Describe multi output boost converter.
4. Explain the push pull converter topology.
5. Illustrate the operation of a single-phase full bridge inverter with neat circuit diagram and waveforms.
6. Explain the concept of multi-level inverters. List out the types of multi-level inverters.
7. Distinguish between active and passive filters.
8. Describe about hybrid filters.

PART B***(Answer one full question from each module, each question carries 6 marks)*****MODULE I**

9. a) Discuss the working of single-phase full converter with RLE load for $\alpha > 90^\circ$ with neat circuit diagram and waveforms. (4)
b) Explain the effect of source inductance in single phase full converter. (2)

OR

10. Explain with neat waveform, how the output voltage of a three-phase full converter with RLE load is obtained by using line voltage for a firing angle of 60° . Derive the average value of output voltage. (6)

MODULE II

11. Discuss with neat circuit diagram and waveforms of a three-phase dual converter in terms of circulating current and derive an expression for the circulating current in terms of supply voltage, reactor inductance, firing angle. (6)

OR

12. With neat circuit diagram and waveforms, explain the operation of a controller which can be used for the speed control of single-phase induction motor. Assume that the controller is operated on RL load. (6)

MODULE III

13. Illustrate the operation of Cuk converter with neat circuit diagram and waveform. Also derive the filter components. (6)

OR

14. A boost regulator has an input voltage of $V_s = 5V$. The average output voltage is 15V and average load current is 0.5A. The switching frequency is 25kHz. If $L = 150\mu H$ and $C = 220\mu F$, determine: (a) duty cycle; (b) ripple current of inductor; (c) the peak current of inductor; (d) the ripple voltage of filter capacitor and (e) the critical values of L & C. (6)

MODULE IV

15. Analyse the switching states of a Flyback converter with relevant circuit diagram and waveforms. (6)

OR

16. Explain the principle of operation of forward converter topology with circuit diagram and waveforms. (6)

MODULE V

17. Explain the 180° mode of operation of a three phase VSI with neat circuit diagram and waveforms. (6)

OR

18. Discuss the various methods of harmonic reduction in inverters. (6)

MODULE VI

19. Analyse how the filters are used to reduce the harmonic distortion. (6)

OR

20. Explain about power conditioning circuits. (6)
