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Question Paper Code: 12053

M.E. DEGREE EXAMINATION, DECEMBER 2013.

First Semester

Power Electronics and Drives

01PPE102 - ANALYSIS OF POWER CONVERTERS

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. State the advantages of bridge type converter over midpoint type converter.
2. What are the merits of semi converter over full converter?
3. Mention some of the applications of phase controlled converters.
4. Give the output voltage equation for three phase semi converter and full converter.
5. What is duty cycle of a chopper?
6. Why forced commutation is required in DC choppers?
7. Draw the typical output voltage waveforms of a single phase AC voltage controller with resistive load.
8. Mention few applications of AC voltage regulators.
9. Why an intergroup reactor is required for three phase cycloconverters?
10. What is cycloconverter?

PART - B (5 x 14 = 70 Marks)

11. (a) Discuss the operation of a dual converter with and without circulating current, bringing out its advantages and disadvantages. (14)

Or

- (b) A single phase fully controlled bridge converter supplies an inductive load. Assuming that the output current is constant and equal to 5 A, determine the following performance measures, if the supply voltage is 230 V and the firing angle is maintained at 30°
- (i) Average output voltage (ii) Supply power factor.
(iii) Fundamental power factor (iv) Supply harmonic factor (14)

12. (a) (i) With neat waveforms explain the three phase full converter with RL load for a value of firing angle 60 degrees. (10)
- (ii) State the different methods of power factor improvements and explain any one method. (4)

Or

- (b) What is overlap angle? Explain the effect of source inductance on a three phase full converter. Also derive its average and RMS values of its output voltage and current? (14)

13. (a) (i) For a step down chopper with R load, express the following variables as function of i/p V, R and duty ratio. (a) Average output V and I (b). Average and RMS freewheeling diode current (c). RMS and average load current. (9)
- (ii) With necessary modes explain the operation of four quadrant chopper. (5)

Or

- (b) (i) Explain Cuk regulator with neat waveforms and derive the value of L and C. (8)
- (ii) A chopper circuit is operating at a frequency of 2 kHz on a 220 V DC. If the load voltage is 170 V, find the conduction and blocking period of the SCR in each cycle. (6)

14. (a) (i) Explain with waveforms the operation of single phase AC voltage controller with RL load. (7)
- (ii) Distinguish between on-off control and phase angle control in AC voltage controllers. (7)

Or

- (b) (i) With neat circuit diagram and relevant waveforms explain the operation of Matrix Converter. (7)
- (ii) Explain with a neat sketch three phase bidirectional AC voltage regulator with delta connected loads. (7)
15. (a) Discuss the operation of a three phase cycloconverter. Indicate how the output harmonics can be reduced. (14)

Or

- (b) (i) Explain various modes of operation of load commutated cycloconverter with waveforms. (8)
- (ii) Explain with neat sketch the operation of single phase step up cyclo converter. (6)

PART - C (1 x 10 = 10 Marks)

16. (a) A single phase full converter is operated with symmetrical angle control. The load current with an average value of I_a is continuous and ripple content is negligible. Express the input current of the converter in Fourier series and determine the harmonic factor HF of input current, Displacement Factor DF and Input power factor. (10)

Or

- (b) Explain buck-boost regulator with neat waveforms and derive the value of L and C. (10)
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