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Question Paper Code: 41253

M.E. DEGREE EXAMINATION, DECEMBER 2014.

First Semester

Power Electronics and Drives

14PPE102 – ANALYSIS OF POWER CONVERTERS

(Regulation 2014)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (5 x 1 = 5 Marks)

1. In a single phase full converter, for continuous conduction, each pair of SCR's conduct for
(a) $\pi - \alpha$ (b) π (c) α (d) $\pi + \alpha$
2. In a three phase full converter, the output voltage pulsates at a frequency equal to
(a) Supply frequency, f (b) 2f (c) 3f (d) 6f
3. A chopper, where voltage as well as current remain negative, is known as
(a) Type – A (b) Type – B (c) Type – C (d) Type – D
4. In a single phase full wave ac regulator, varying the delay angle α from 0 to π can vary the RMS output voltage from
(a) V_s to $V_s / 4$ (b) V_s to $V_s / 2$ (c) V_s to $3V_s / 2$ (d) V_s to 0
5. Cycloconverter converts
(a) ac voltage to dc voltage
(b) dc voltage to dc voltage
(c) ac voltage to dc voltage at same frequency
(d) ac voltage supply frequency to ac voltage at load frequency

PART - B (5 x 3 = 15 Marks)

6. Write in brief, how the load current is made continuous in the operation of a single phase converter.
7. A three phase full converter charges a battery from a three phase supply of 230 V, 50 Hz. The battery EMF is 200 V and internal resistance is 0.5 Ohms. Current is continuous and constant with a value of 20 amps. Calculate the firing angle delay and supply power factor.
8. What is the operational principle of step up chopper.
9. List out the advantages and disadvantage of Matrix converter.
10. Explain the method to reduce the output harmonics in cycloconverter.

PART - C (5 x 16 = 80 Marks)

11. (a) Describe the working of single phase full converter in the rectifier mode and inverter mode. (16)

Or

- (b) A single phase half controlled converter connected to 230 V, 50 Hz source with a load of $R = 10$ Ohms in series with a large inductance that makes the load current ripple free for a firing angle of 45° . Calculate the input and output performance parameters of the converter. (16)

12. (a) With a neat circuit diagram, explain the operation of three phase semi controlled rectifier supplying RL load. Sketch the output voltage waveforms for three different firing angles. (16)

Or

- (b) A three phase full converter connected from a three phase supply of 400 V, 50 Hz with load $R = 10$ Ohms and back EMF $E = 350$ V. Current is ripple free. Calculate the power delivered to the load and input power factor for (i) Firing angle of 30° (ii) Firing advance angle of 60° . (16)

13. (a) With a neat circuit diagram, explain the operation of four quadrant chopper. (16)

Or

(b) With a neat circuit diagram, explain the operation of buck converter. (16)

14. (a) Explain the operation of single phase full wave AC voltage regulator and obtain the expression for average and RMS value of output voltage with (i) R load (ii) RL load. (16)

Or

(b) With a suitable circuit diagram and waveforms, explain the operation of three phase full wave AC controller. (16)

15. (a) Explain single phase step up cycloconverter with neat waveform. (16)

Or

(b) Explain three phase to single phase cycloconverter with neat waveform. (16)
