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Question Paper Code : 13933

M.E. DEGREE EXAMINATION, JANUARY 2015.

First Semester

Power Electronics and Drives

PX 7102 — ANALYSIS OF POWER CONVERTERS

(Common to M.E. Control and Instrumentation Engineering)

(Regulation 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the significance of freewheeling diode in a semi-converter?
2. Distinguish between Holding Current and Latching Current.
3. What is meant by distortion factor?
4. Mention the applications of 12 pulse converter.
5. Enumerate the control strategies of chopper.
6. Compare ZVS and ZCS.
7. Why TRIAC is not operated with negative gate current in I quadrant and positive gate current in III quadrants?
8. Give the expression of RMS output voltage of single phase full wave ac voltage controller with RL load.
9. What are the merits and demerits of matrix converter?
10. Differentiate Cycloconverter from Dual Converter.

PART B — (5 × 16 = 80 marks)

11. (a) Discuss the operation of fully controlled rectifier feeding RL load in continuous and discontinuous modes of operation with neat waveforms.

Or

- (b) Analyze the effect of source inductance on single phase converter and prove how the average output voltage is reduced?

12. (a) Explain with neat waveforms the operation of three phase full converter feeding RLE load. Also derive the expression for average and RMS output voltage, under continuous conduction mode.

Or

- (b) (i) Explain with neat diagram the operation and working principle of a 6 pulse converter supplying 'R' load. (8)
- (ii) A three phase half wave controlled rectifier is operated from a three phase star connected 220 V, 60 Hz supply with a load resistance of 10 ohms. If the average output voltage is 25 % of the maximum possible average voltage, Calculate (1) delay angle (2) RMS and average output currents (3) rectification efficiency (4) input power factor. (8)
13. (a) Discuss the operation of ZVS quasi resonant Boost Converter with neat diagrams.

Or

- (b) (i) Explain the working of buck regulator and determine its peak to peak ripple current and voltage. (8)
- (ii) A buck-boost converter has an input voltage of 12 V with duty cycle of 0.6 and switching frequency of 25 kHz. The filter inductance is 250 μ H and filter capacitance is 220 μ F. The average load current is 1.5 A. Determine (1) average output voltage (2) peak-to-peak ripple voltage (3) peak-to-peak ripple current (4) peak current through the switch. (8)
14. (a) Explain the operation of three phase star connected AC voltage controller with R and RL loads.

Or

- (b) (i) Draw and explain the static characteristics of TRIAC. (8)
- (ii) A single phase ON-OFF AC voltage controller has input voltage of 220 V, 50 Hz and load resistance of 20 Ω . For 30 ON cycles and 70 OFF cycles, determine (1) RMS output voltage (2) input power factor (3) average thyristor current (4) RMS thyristor current. (8)
15. (a) Explain with waveforms the working of step up and step down 1- ϕ & 3- ϕ - cycloconverters.

Or

- (b) Explain with suitable waveforms the various quadrants of operation of a three phase dual converter. Also derive an expression for average output voltage.