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Question Paper Code : 41059

M.E./M.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

First Semester

Power Electronics and Drives

PX 5152 — ANALYSIS AND DESIGN OF POWER CONVERTERS

(Common to Power Systems Engineering)

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is the effect of source impedance in a single phase AC-DC converter?
2. What are all the advantages and disadvantages of 3 phase full converter?
3. Draw the topology of semi controlled AC — DC converter.
4. Mention the applications of isolated converter.
5. Write the logic behind time ratio control of DC — DC converter.
6. A single quadrant chopper operating on third quadrant is supplied with from a load voltage waveform consists of square pulses of duration of 5 ms and overall chopping time period of 2 s. Calculate the voltage ripple factor.
7. What is meant by hard switching?
8. Classify resonant converters.
9. Define matrix converter and mention its application.
10. Write the design parameters of 3 phase dual converter.

PART B — (5 × 13 = 65 marks)

11. (a) Describe the working of three phase fully controlled bridge converter in the inversion mode with RL Load with neat sketch and waveform. (13)

Or

- (b) A 3 phase bridge converter is used for obtaining a regulated DC output voltage. The supply voltage is 650 V and the firing angle is maintained at 30 degrees so that the load current is 20 A. Calculate :

- (i) DC output voltage
- (ii) Active and reactive power input
- (iii) DC output voltage if freewheeling diode is connected
- (iv) Derive the expression. (13)

12. (a) Discuss the effect of source inductance on the performance of a three phase half controlled bridge converter (13)

Or

- (b) Explain the continuous and discontinuous mode of operation of 3 phase semiconverter connected to RL load. (13)

13. (a) Explain the working of resonant converter with neat diagram and waveform. (13)

Or

- (b) Describe the working of SEPIC converter with neat diagram. (13)

14. (a) A 3 phase voltage controller feeds an RL load the value of $R = 9 \Omega$ and $L = 9.3 \text{ mH}$, the controller is supplied with 650 V, 50Hz supply for $\alpha = 90$ degrees. Determine :

- (i) Conduction angle
- (ii) Average output voltage
- (iii) RMS output voltage
- (iv) Power factor also
- (v) Derive the expression for instantaneous current. (13)

Or

- (b) Explain the working of star connected 3 phase AC voltage controller with RL load with neat diagram and waveform for $\alpha = 30$ degrees. (13)

15. (a) Explain the working of single phase cycloconverter and mention its circuit arrangement and also mention its applications. (13)

Or

- (b) Explain the working principle and operation of single phase to single phase discontinuous mode operation of cycloconverter. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Explain the steps involved in design of power converters used for UPS.

Or

- (b) How do you select a component for a AC drive applications, what are all the parameters to be calculated? Explain it with an example.