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M.E./M.Tech. Degree Examinations, January 2017

First Semester

POWER ELECTRONICS AND DRIVES

PD16102 – ANALYSIS OF POWER CONVERTERS

(Regulation 2016)

QP Code:531210

Time: Three hours

Maximum : 100 marks

Answer **ALL** questions

PART A - (10 X 2 = 20 Marks)

1. State the advantages of GTO over SCR.
2. What is the inversion mode of converter.
3. Mention the advantages of three phase converters over single phase converters.
4. What is the effect of source inductance on the performance of converter?
5. What are the assumptions are to be made during the analysis of DC-DC converter circuits?
6. Compare the frequency modulation scheme with pulse width modulation scheme.
7. Mention the applications of AC voltage controllers.
8. What is meant by integral cycle control?
9. List out the applications of cycloconverters.
10. Which type of cycloconverter requires forced commutation? Why is it required?

PART B - (5 X16 = 80 Marks)

11. (a) Explain the operation of single phase half controlled converter with RL load (16)
with neat waveforms. Derive average and RMS voltage equations.

(OR)

- (b) Explain in detail about the operation of single phase fully controlled (16)
converter with RLE load operating in continuous mode. Derive its average
output voltage equation.
12. (a) Explain the operation of 1 ϕ fully controlled converter along with source (16)
impedance. Derive average output voltage equation.

(OR)

- (b) Explain with neat sketches the operation of three phase dual converter in circulating current and circulating current free mode. **(16)**

13. (a) Analyze the operation of a Buck- Boost converter and derive an expression for the output voltage. **(16)**

(OR)

- (b) What is meant by soft switching converter? Explain with neat sketches, the operation of ZVS resonant converter. **(4+12)**

14. (a) (i) Explain with neat sketch, the operation of two stage sequence control of voltage controller with RL load. **(8)**

- (ii) Explain the operation of multi-stage sequence control of AC voltage controller. **(8)**

(OR)

- (b) Explain in detail about the single phase AC voltage controller with RL load. Derive the average and RMS output voltage equations. **(16)**

15. (a) Discuss in detail about the operation of three phase to single phase cyclo-converter with neat circuit diagrams and waveforms. **(16)**

(OR)

- (b) (i) A three phase to single phase cyclo-converter employs a three pulse positive and negative group converters. Each converter is supplied from delta/star transformer with per phase turns ratio of 2:1. The supply voltage is 400V, 50 Hz. The RL load has $R = 2$ ohms and at low output frequency, $\omega_o L = 1.5$ ohms. In order to account for commutation overlap and thyristor turn-off time, the firing angle in the inversion mode should not exceed 160° . Compute the value of the fundamental rms output voltage and rms output current. **(8)**

- (ii) Repeat the same in case three phase to single phase cyclo-converter employs six pulse bridge converter. **(8)**