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PSNA College of Engineering and Technology

Department of Electrical and Electronics Engineering

Serial Test-I

ANALYSIS OF POWER CONVERTERS

Year/Sem : I/I

Max.Marks:50

Staff In-charge: M.Kaliamoorthy

Time: 90 Mins

Part A (9 * 2 = 18)

Answer any **NINE** questions

1. Define phase control, delay angle of a converter.
2. Define conduction angle, Extinction angle and overlap angle.
3. What is the function of freewheeling diode in converters?
4. What are the advantages of bridge converters over centre tapped transformer converters?
5. Write the average voltage expression for 1Ø semi controlled and 1Ø fully controlled converter.
6. Define Input power factor of two pulse rectifiers.
7. What is Dual converter?
8. What is inversion mode of converters?
9. Draw the graph of Average output voltage Vs Firing angle for fully controlled rectifier.
10. Give the expression for E_{RMS} of output voltage of half controlled rectifier.

Part B (2 * 16 = 32)

Answer **ALL** questions

11. Explain the operation of a single phase fully controlled bridge converter with necessary wave forms and equations for RLE load and discuss
 - i) Continuous mode operation (10)
 - ii) Discontinuous mode operation (6)

(Or)

12. A single phase full converter bridge is connected to RLE load. The source voltage is 230V, 50Hz. The average load current of 10A is constant over the working range. For $R=0.4\text{Ohms}$ and $L=2\text{Mh}$, calculate
 - (a) Firing angle delay for $E=120\text{Volts}$ (4)
 - (b) Firing angle delay for $E=120\text{Volts}$ (4)

Indicate which source is delivering power to load in parts (a) and (b). Sketch the time variations of output voltage and load current for both the parts (4)

(c) In case output current is assumed constant, find the input PF for both (a) and (b) (4)

13. A Single phase fully controlled converter is used for obtaining a regulated d.c output voltage. The RMS value of the a.c input voltage is 230V, and the firing angle is maintained at 60 degree, so that the load current is 4A.

(i) Calculate d.c output voltage and active and reactive power input.

(ii) Assuming that the load resistance remains the same,

Calculate the quantities (i) if a freewheeling diode is used at the output. The firing angle is maintained at 60 degree.

(iii) If SCR3 is damaged and gets opened, calculate the average d.c output voltage for the average direct-current output. For this case, a freewheeling diode is connected. The firing angle is 60 degree. (16)

(Or)

14. A single phase controlled rectifier bridge consists of one SCR and three diodes. (a) Sketch output voltage waveform for a firing angle α for the SCR and hence obtain an expression for the average output voltage under the assumption of constant current (R load). Show the conduction of various components as well.

(b) Draw waveforms of current through T1, D1, D2 and D3

(c) For an ac source voltage of 230V, 50Hz and firing angle of 45 degrees. Find the average output current and power delivered to battery in case load consists of $R=5\Omega$, $L=8\text{ mH}$ and $E=100\text{ V}$ (16)

Faculty In charge

Head of the Department

(Solution to this complete question paper should be submitted as assignment on 17.09.2010)