NR/R09

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I Semester Examinations, March/April 2011

ANALYSIS OF POWER ELECTRONIC CONVERTERS

(COMMON TO ELECTRICAL POWER ENGINEERING, ELECTRICAL POWER SYSTEMS, POWER AND INDUSTRIAL DRIVES, POWER ELECTRONICS AND ELECTRIC DRIVES, POWER ENGINEERING AND ENERGY SYSTEMS, POWER ELECTRONICS)

Time: 3hours **Max. Marks: 60**

Answer any five questions

All questions carry equal marks

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1. a) Explain the operation of 1-ϕ voltage controller with RL-load with neat circuit and wave forms.

   b) Discuss the concept of synchronous tap changes. [12]

2. A 3-phase, 3-wire AC regulator supplies a star connected resistive load of R=10.0 ohm and line to line input voltage is 230 V (rms), 50 Hz. The firing angle is 30^0. Determine:
   i) rms output voltage.
   ii) Input power factor
   iii) Expression for instantaneous output voltage of phase R. [12]

3. A single phase voltage controller feeds power to a resistive load of 3Ω from 230V, 50 Hz source. Calculate:
   i) The maximum values of average and rms thyristor currents for any firing angle, 'α'.
   ii) The minimum circuit turn-off time for any firing angle, α.
   iii) The ratio of 3rd harmonic voltage to fundamental voltage for $\alpha = \pi/3$
   iii) The angle, `α' at which the greatest forward or reverse voltage is applied to either of the thyristors and magnitude of these voltages. [12]

4. Explain the operation of dual converter both circulating and non circulating modes of operation. Mention its applications, advantages and disadvantages. [12]

5. What is pulse width modulation control of converters and what are the applications? A single phase full converter is connected to RLE load. The source voltage is 230 V, 50 Hz. The average load current of 10A is continuous over the working range. For R=0.4Ω and L = 2mH, compute the firing angle delay for E=120 V. [12]

Contd….2

6. A three-phase, half wave converter is operated from a 3-phase, Y-connected 440 V, 50 Hz supply and the load resistance is R = 20 Ω. If it is required to obtain an average output voltage of 50% of the maximum possible output voltage, calculate:
   a) Firing angle, α.
   b) rms and average output currents.
   c) Rectification efficiency.
   d) Input power factor. [12]

7. Discuss about switched mode regulators. Explain the operation of buck and boost regulators. Mention the applications and advantages of these regulators. [12]

8. Write about:
   i) Single phase bridge inverter.
   ii) Harmonic reduction techniques. [12]

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