NR/R09

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

M.Tech I Semester Examinations, October/November-2011

ANALYSIS OF POWER ELECTRONIC CONVERTERS

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

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 R-load with neat circuit and wave forms.

   b) Explain two stage sequence control of voltage controller for R-load. [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 AC voltage regulator feeds a R-L load with the following parameters. Input voltage = 230V (rms), frequency = 50 Hz, resistance R=4 ohms and inductance L = 10 mH. Calculate:
   i) The control range of firing angle,
   ii) The maximum value of rms load current,
   iii) The maximum power and power factor. [12]

4.a) What is a Cyclo converter? Explain the principle and operation of single phase cyclo converter with neat diagram and wave forms.

   b) What are the applications of cyclo converter? What are the effects of load inductance on the performance of cyclo converters? [12]

5. A single phase fully controlled thyristor bridge converter supplies on inductive load. Assuming that the output current is virtually constant and is equal to I_d, determine the following performance measures, if the supply voltage is 230 V and if the firing angle is maintained at 60^0.
   a) Average output voltage,
   b) Input rms current and input fundamental rms current,
   c) Displacement factor and power factor,
   d) Supply harmonics factor and voltage ripple factor. [12]

Contd…..2

6. A 3-phase, fully controlled bridge converter is connected to a three phase AC supply of 400 V, 50 Hz and operates at a firing angle of 45^0. The load current is maintained constant at 10A and load voltage is 360 V. Compute
   a) Source inductance
   b) Load inductance
   c) Overlap angle
   d) If the source inductance is reduced to half, find the output voltage. [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. Explain the voltage control of single phase inverters with the help of waveforms. [12]

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