Code No. A5402

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JAWAHARLAL NEHRU TECHNOLOGY UNIVERSITY, HYDERABAD
M.Tech. I Semester Regular Examinations, March – 2009
ANALYSIS OF POWER ELECTRONIC CONVERTERS
(Common to Power Electronics & Electric Drives, Power Electronics,
Electrical Power Engineering and Power Engineering & Energy Systems)

Time: 3 hours   **Max. Marks.60**
Answer any Five questions
All questions carry equal marks

1.a)   Explain about synchronous tap changers. Give the applications.
  b)   The single-phase full wave controller supplies an RL load. The input rms voltage is V_s = 120 V, 60 Hz. The load is L = 6.5 mH and R = 2.5 Ω. The delay angles of thyristors are equal $\alpha_1 = \alpha_2 = \pi/2$. Determine:
      i)   The conduction angle of thyristor T_1 Si
      ii)   The rms thyristor current I_R
      iii)   The input power factor.

2a)   The three phase unidirectional controller supplies a Y-connected resistive load with R = 2.5 Ω and the line-to-line input voltage is 208 V (rms), 60 Hz. If the desired output power is P_0 = 12 KW. Calculate:
      a)   the delay angle, α
      b)   the rms output phase voltage V_0, and
      c)   the input PF
  b)   What are the advantages and disadvantages of ac voltage controllers?

3.a)   What is a cyclo converter? Explain the principle and operation of single-phase cyclo converter with neat diagram draw the waveforms.
  b)   What are the effects of load inductance on the performance of cyclo converters?

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

5.   For a 3 phase full converter, sketch the input voltage waveforms for V_{ab}, V_{ac}, V_{bc} etc and voltage variation across any one thyristor for one complete cycle for a firing angle delay of:
      a) 60^0 and
      b) 120^0

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6.a)   How can the input current of the rectifier-fed boost converter be made sinusoidal and in phase with the input voltage?

b)   The buck regulator has an input voltage V_s=15 V. The required average out put voltage V_a=5 V and the peak-to-peak out put ripple voltage is 10 mV. The switching frequency is 20 KHz. The peak-to-peak ripple current of inductor is limited to 0.5A. Determine:

i)   the duty cycle K,

ii)   the critical values of L and C.

7.   Explain the voltage control of single phase inverters with the help of waveforms.

8.a)   What are the techniques for harmonic reductions?

b)   Explain about the back and boost inverter and give the advantages and applications.

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