

**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**

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- 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  $R = 2.5$   $\Omega$ . 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.
  
- 2.a) The three phase unidirectional controller supplies a Y-connected resistive load with  $R = 2.5$   $\Omega$  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,  $\alpha$
  - 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  $R = 0.4\Omega$  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)  $60^\circ$  and
  - b)  $120^\circ$

**Contd...2**

- 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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