JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT
T – 3 EXAMINATION-MAY JUNE-2016
B.Tech. VI Semester (ECE)

COURSE CODE:10B1WEC613   MAX. MARKS: 35
COURSE NAME: Power Electronics
COURSE CREDITS: 04   MAX. TIME: 2 HRS

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.

Q1. Discuss how a thyristor may be subjected to internal and external over voltages. Describe the methods adopted to suppress over voltages in thyristor based systems.   [5]

Q2. a) What are the different components of power loss that occur in a thyristor during its working? Which of the power loss component(s) is/are dominant at power frequencies and which at high frequencies?

b) Why are three phase rectifiers preferred over single phase rectifiers?   [5]

Q3. A 3- phase M-3 convertor is operated from 3 phase, 230V, 50Hz supply with a load resistance R=10Ω. An average output voltage of 60% of the maximum possible output voltage is required. Draw output voltage waveform and determine (a) the firing angle, (b) average and rms value of load current and (c) rectification efficiency.   [5]

Q4. Derive the expression for steady state ripple observed in type A chopper assuming continuous load current and suggest methods to minimize the ripple. Prove that for type A chopper operated in continuous conduction mode, per unit ripple in the load current is maximum when duty cycle $\alpha = 0.5$.   [5]

Q5. Using properly labeled circuit diagram and waveforms show that output frequency of basic series inverter is given by

$$f_o = \frac{1}{\frac{2\pi}{\sqrt{\frac{1}{LC}-\left(\frac{R}{2L}\right)^2}} + 2T_{off}}$$

What are the disadvantages of using basic series inverter? Calculate circuit turn off time for basic series inverter if R=3Ω, L = 60μH, C = 7.5μF and Vs = 220V dc.   [5]

Q6. What are the techniques for AC voltage control? Explain the principle of integral cycle control. If a single phase voltage controller is operated for 5 cycles on and 3 cycles off using input voltage of 200V, 50 Hz and a load of R = 20Ω, determine a) rms output voltage b) average and rms thyristor current.   [5]

Q7. Explain the working principle of cyclo-convertor operation. Draw the circuit diagram for bridge type cyclo-convertor and using waveforms explain how can we use same device as step up or step down convertor. Is it possible to use this device as rectifier? State the reason to support your answer.   [5]