

R09

Code No: 09A50205

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD

B. Tech III Year I Semester Examinations, May/June – 2013

Power Electronics
(Electrical and Electronics Engineering)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

- 1.a) Sketch the static and dynamic characteristics of SCR during turn-on process. Write down the necessary conditions required to turn-on SCR.
- b) Explain briefly about turn on and turn off methods of SCR. [15]
- 2.a) What are the different firing circuits used for triggering SCR?
- b) Compare and contrast SCR, BJT and IGBT. [15]
- 3.a) Explain the operation of a single-phase, half-wave converter for R-load with neat circuit diagram and necessary waveforms.
- b) A resistive load of 10 ohms is connected through a half-wave SCR circuit to 220V₀, 50Hz, 1- Φ source. Calculate the power delivered to load for a firing angle of 60°. [15]
- 4.a) Explain the operation of single phase full wave controlled rectifier feeding an inductive load. Consider the effect of source inductance and derive an expression for output voltage in terms of source inductance and firing angle.
- b) What are the advantages and disadvantages of a single-phase bridge converter over single-phase midpoint converter? [15]
- 5.a) Explain the effect of free wheeling diode in the case of three phase converters with neat waveforms.
- b) Explain clearly the operation of a three phase dual converter. [15]
- 6.a) What are steps involved in determining the output voltage waveform for single phase ac voltage controller with two SCRs connected back to back?
- b) A three phase fully controlled bridge is connected to a highly inductive load with a resistance of 60 ohms. Determine average voltage, average load current and input power factor for firing angle of 30°. The input supply voltage is 400 V, 50 Hz. Assume load current to be ripple free. [15]
- 7.a) What are choppers and how are they classified?
- b) Explain the operation of a dc – dc converter with a load commutation circuit. Sketch the waveforms of current, voltage across thyristor, load voltage. [15]
- 8.a) Explain the simple SCR inverter circuit employing class A-type commutation. Discuss the limitations of this inverter.
- b) Explain the operation of a series inverter. In a series inverter R = 4 Ω , L = 50mH and C = 6 μ F. The DC input voltage is 200V DC and output frequency is 6 kHz. SCR turn-off time is 6 μ s. Find
 - i) Available circuit turn-off time.
 - ii) Maximum possible frequency. [15]
