Q-1

C.U. SHAH UNIVERSITY Winter Examination-2018

Subject Name: Power Electronics - I

Subject Code: 4TE05PEL1			Branch: B.Tech (Electrical)	
Semes	ter: 5	Date: 28/11/2018	Time: 10:30 To 01:30	Marks: 70
 Instructions: (1) Use of Programmable calculator & any other electronic instrument is prohibited. (2) Instructions written on main answer book are strictly to be obeyed. (3) Draw neat diagrams and figures (if necessary) at right places. (4) Assume suitable data if needed. 				
Attempt the following questions:				
a)	What are the e	ssential requirements of a ga	te triggering pulse?	
b)	Why equalizing	ng circuits are provided in ser	ries connection of thyistors?	

- c) Define intrinsic standoff ratio of UJT?
- d) What is Commutation? List various conditions necessary for the commutation of SCR.
- e) How thyristors are protected against over voltage and over current.
- f) Explain difference between half controlled and full controlled Bridge rectifier.
- g) What should be pulse width in single pulse modulation of PWM inverter to eliminate third harmonic?
- h) Explain the terms Duty cycle and chopper frequency.
- i) How many thyristors are required in three phase to three phase three pulse cycloconverter?
- j) Define and explain latching and holding current.
- k) Give comparison of AC voltage controller, Inverter and Cycloconverter with reference to input given and output obtained from this device
- 1) If power factor angle is greater than firing angle, can AC voltage controller control the output power? (Yes, No)
- m) Write down equation for average value of output voltage for half wave AC voltage controller.



n) Define the string efficiency and de-rating factor of thyristors connected in series

Q-2 Attempt all questions

- a) What is snubber circuit? Why is it needed? Draw such circuit for a SCR and give guidelines for selecting it's components
- b) With the help of neat diagram explain the working and characteristics of IGBT. List advantages and disadvantages of IGBT over Power BJT

Q-3 Attempt all questions

- a) What is the necessity of connecting SCRs in series? What are the problems associated with series connections of SCRs? How are they eliminated?
- b) Draw the internal diagram of an SCR (specifying the different layers and their doping levels) and hence, explain the various operating modes of the device. Also draw the static V- I characteristic of the SCR

Q-4 Attempt all questions

- a) Explain in brief various control strategies of a chopper
- b) Draw the circuit configuration of step up chopper and explain its working. Derive its output voltage equation in terms of duty cycle and input voltage.

Q-5 Attempt all questions

- a) What are line commutated inverters? How do they operate? Explain the difference between line commutated and force commutated inverters
- b) Explain 120 degree mode of 3-Ø bridge inverter with resistive load.

Q-6 Attempt all questions

- a) Give the comparison between a cycloconverter and a dc link converter
- b) Discuss 3-phase full wave AC voltage controller with Y and Δ connected load.



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Q-7 Attempt all questions

- a) Write a note on single phase dual converter showing the circuit configuration and details of operation. What are the applications of such a dual converter?
- b) For a single phase full wave controlled converter with RLE load, draw the circuit diagram and necessary waveforms. Derive the mathematical expressions of output voltage.

Q-8 Attempt all questions

- a) Explain the basic principle of operation of a cycloconverter with neat equivalent circuit diagram.
- b) What is load commutated cycloconverter? How does it differ from line commutated cycloconverter?

