

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-V (Old) EXAMINATION – WINTER 2019****Subject Code: 150903****Date: 04/12/2019****Subject Name: Power Electronics - I****Time: 10:30 AM TO 01:00 PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Define and explain the need of snubber circuit. Draw such circuit for SCR and give guidelines for selecting its components. **07**  
(b) Explain voltage ratings of SCR. **07**
- Q.2** (a) What do you mean by freewheeling action? Explain How diode can provide freewheeling action? **07**  
(b) State and explain the various turn-on methods for SCR. **07**
- OR**
- (b) Draw and explain two transistor analogy of a Thyristor. **07**
- Q.3** (a) Draw the circuit of a single phase fully controlled converter with R-L load. Derive necessary equations and sketch output waveforms. **07**  
(b) Explain V-I characteristic & working of Triac. **07**
- OR**
- Q.3** (a) Using relevant circuit diagram and waveforms, explain Complimentary forced commutation (class C) method. **07**  
(b) For a single phase fully controlled converter with RLE load, draw the circuit diagram and waveforms of input & output voltages and currents, and voltage across SCR. Derive the mathematical expressions of output voltage. **07**
- Q.4** (a) Discuss the various techniques of improving power factor in phase controlled converters. Explain PWM techniques in detail with necessary waveforms. **07**  
(b) 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? **07**
- OR**
- Q.4** (a) Explain the operation of three phase half wave controlled converter with RL load. Sketch the associated waveforms for  $\alpha = 60^\circ$ . **07**  
(b) With a neat circuit diagram and waveforms describe the Morgan's Chopper circuit. State its applications & limitations. **07**
- Q.5** (a) State the principles of DC motor speed control. Explain the single phase semi-converter DC motor drive. **07**  
(b) Explain the working of step-down and step-up chopper. Give the comparison between step-down and step-up chopper. **07**
- OR**
- Q.5** (a) What are the control strategies for chopper? Explain in brief. **07**  
(b) Discuss constant H.P and constant Torque operation of speed control of motors. Specify their field of applications. **07**

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