

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER I - EXAMINATION – SUMMER 2017

Subject Code: 2710702**Date: 10/05/2017****Subject Name: Power Electronics****Time: 02:30 pm to 05:00 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) Discuss static and dynamic characteristics of power MOSFET and IGBT. **07**
(b) Draw the circuit diagram of buck-boost converter and explain the continuous conduction mode of operation with necessary waveform and equation. **07**
- Q.2** (a) With neat circuit diagram and waveforms, explain the working of Flyback converter. Derive output voltage in terms of duty ratio. **07**
(b) Explain the working of cuk converter with neat diagram and necessary waveform. Derive the expression for output voltage. **07**
- OR**
- (b) With neat circuit diagram and waveforms, explain the working of practical forward converter. Derive output voltage in terms of duty ratio. **07**
- Q.3** (a) Explain unipolar modulation scheme for H-bridge inverter operation. How is it different from bi-polar modulation? What is the effect of unipolar schemes on the output voltage's harmonic spectrum? **07**
(b) Draw space vector diagram for 3-phase voltage source inverter. Explain the control of inverter using space vector modulation. **07**
- OR**
- Q.3** (a) Explain the working of Auto-Sequential Commutated Current Source Inverter with neat diagram, necessary waveforms. **07**
(b) Explain various harmonic reduction techniques used in inverter. **07**
- Q.4** (a) How design of magnetic components used in power electronic circuit is different than when used in normal electric circuits? Explain 'Area of Product' method in brief. **07**
(b) Draw the neat circuit diagram of three phase full wave AC voltage controller and explain its working with wave forms for firing angles $\alpha=60^\circ$. **07**
- OR**
- Q.4** (a) Explain the working of 3-phase to 3-phase cyclo-converter with necessary circuit and waveforms. **07**
(b) Classify A.C. voltage controller & explain principle of ON-OFF control & Phase angle control. **07**
- Q.5** (a) Describe the necessity of Isolation of gate and base drives and explain how they are implemented using the pulse transformer and optoisolator with necessary circuit diagrams. **07**
(b) Draw power circuit for a three phase full converter feeding RLE load. Draw output voltage waveforms for a firing angle delay (α) of 60° indicating the conduction of its various elements on the assumption of continuous output current. Hence, obtain an expression for the average output voltage in terms of α . **07**

OR

- Q.5** (a) Explain how two three phase full converters can be connected back to back to form a circulating current type of dual converter. Discuss its operation with the help of voltage waveform across (a) each converter (b) load and (c) reactor. **07**
- (b) Explain the effect of source inductance for single phase full converter. Also derive the equation of output voltage V_0 in terms of firing angle α and source inductance L_s . **07**
