

GUJARAT TECHNOLOGICAL UNIVERSITY
ME – SEMESTER I (NEW) – • EXAMINATION – SUMMER 2016

Subject Code: 2710702**Date: 18/05/2016****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) Draw the circuit diagram of boost converter and explain the continuous conduction mode of operation with necessary waveform and equation. **07**
- (b) Compare Power MOSFET, IGBT and SCR with respect to their construction, ratings available, switching characteristics, switching speeds, applications etc. **07**
- Q.2** (a) Draw circuit diagram of cuk converter and explain its working with waveform and equations. **07**
- (b) With neat circuit diagram and waveforms, explain the working of Push-Pull converter. Derive output voltage in terms of duty ratio. **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 various harmonic reduction techniques used in inverter. **07**
- (b) Explain space vector control of 3-phase bridge inverter. Show that the amplitude of output voltage with space vector technique is 15.5 % higher than that obtained with sine-triangle PWM technique. **07**
- OR**
- Q.3** (a) Explain bi-polar modulation in relation to inverter operation. How is it different from unipolar modulation? What is the effect of bi-polar schemes on the output voltage's harmonic spectrum? **07**
- (b) Explain the working of three-phase current source inverter with neat diagram and necessary waveforms. Compare it with voltage source inverter. **07**
- Q.4** (a) Classify A.C. voltage controller & explain principle of ON-OFF control & Phase angle control. **07**
- (b) Explain three phase bidirectional delta connected controller with wave form of gate pulse & line current for $\alpha = 120^\circ$. **07**
- OR**
- Q.4** (a) Explain the operation of three-phase to single phase cycloconverter with neat diagram and necessary waveform. Derive the expression of output voltage. **07**
- (b) 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**
- Q.5** (a) 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**
- (b) Explain two different modes of operation of dual converter. Also derive the relation between firing angles α_1 and α_2 . **07**
- OR**
- Q.5** (a) Explain extinction angle control technique to improve power factor of single **07**

phase semi-converter and full converter? Also explain pulse with modulation technique to improve power factor of single phase full converter.

- (b) 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**
