

**GUJARAT TECHNOLOGICAL UNIVERSITY**  
**ME - SEMESTER- II(Old course) • EXAMINATION (Remedial) – WINTER- 2015**

**Subject Code: 1720709****Date: 14/12/2015****Subject Name: Advanced Power Converters****Time: 2:30 pm to 5:00 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 the basic concept of multi pulse converter. What are its advantages? Explain how the number of pulses can be increased from available 3 phase supply. **07**
- (b) How resonant dc-dc converters differ from that of conventional dc-dc converters. Explain the operation of series loaded resonant half bridge dc-dc converter, operating with switching frequency  $\omega_s < \omega_0/2$ . **07**
- Q.2** (a) Draw the schematic representing 18 pulse converter. Mention in brief significance of each component used to realize 18 pulse converters. **07**
- (b) With relevant waveforms and circuit diagram explain operation of parallel loaded resonant half bridge dc to dc converter operating in discontinuous mode. **07**
- OR**
- (b) What do you mean by soft switching? How ZCS and ZVS principle can help in achieving it? Discuss its significance in brief using the switching loci for the following cases i) hard switching ii) switching when snubber circuit is used iii) switching when ZVS is used. **07**
- Q.3** (a) Write a brief note on NPC inverter. **07**
- (b) Discuss the advantages of matrix converter. Discuss commutation and protection issues related to matrix converter. **07**
- OR**
- Q.3** (a) Write a brief note on electronics switches used in matrix converter. **07**
- (b) What do you mean by instantaneous reactive power? How can the instantaneous reactive power need of a load be compensated using a power converter? Show the detailed scheme along with brief description of the scheme. **07**
- Q.4** (a) Explain the principle of level and phase shifted PWM strategies for cascaded multi-level inverter and critically evaluate these control strategies in terms of their advantages and disadvantages. **07**
- (b) Comment on harmonic contents in the input current and output voltage of converters used in HVDC transmission. Hence, discuss the various types of filters that need to be employed to eliminate these harmonics. **07**
- OR**
- Q.4** (a) How can one get more than 5 levels in phase voltage with only two cascaded H-bridge converters? List all the possible levels available in the phase voltage and line voltage. Also mention the demerits of the scheme if any. **07**
- (b) Write a brief note on UPFC converter. **07**
- Q.5** (a) Discuss in brief how to control the converters for HVDC transmission system. **07**
- (b) Justify the role of power electronics converter in effective utilization of the PV array (in terms of extracting the maximum power from the array). Select the power electronics converter of your choice to discuss the concept. **07**

**OR**

- Q.5 (a)** With suitable block diagram discuss the control scheme for Doubly Fed Induction Generator based wind energy generation system. **07**
- (b)** Draw the space vector diagram for diode-clamped 3-level inverter. Hence, derive the dwell time equations for the space vectors for any one region. **07**

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