

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. Sem. – IInd - Examination – June/July- 2011****Subject code: 1720709****Subject Name: Advanced Power Converters****Date: 29/06/2011****Time: 10:30 am – 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) With relevant waveforms and circuit diagram explain the operation of parallel loaded resonant (PLR) half-bridge DC-DC converter operating in discontinuous mode. **07**
- (b) With the help of a neat phasor diagram, derive the necessary equations for a Y/Z-2 configuration that can help to decide the number of turns to achieve a desired phase shift. **07**

- Q.2** (a) Draw the schematic representing an 18-pulse converter. Mention in brief the significance of each component used to realize the 18-pulse converter. **07**
- (b) What do you mean by soft switching? How the 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 and (iii) switching when ZCS and/or ZVS is employed. **07**

OR

- (b) With neat waveforms discuss the operation of ZVS resonant switching converters. **07**

- Q.3** (a) Mention the advantages of a Matrix converter with respect to the other means by which output voltage's magnitude and frequency can be controlled. Draw the basic matrix configuration and discuss the various possible useful switching state combinations. **07**
- (b) Draw the circuit topology of a 4-level flying capacitor multilevel inverter. Also, list the levels in the output phase voltage and the possible combinations that can give those levels. What are the disadvantages with the topology over other multilevel inverters? **07**

OR

- Q.3** (a) Why does one require bi-directional switches for a matrix converter? How can such bi-directional switches be obtained? Also, critically evaluate/compare these bi-directional switches. **07**
- (b) Write a brief note on any one modulation technique that can be used for control of Matrix converter. **07**

- Q.4** (a) List the various possible switch combinations and the state space vectors for three levels NPC multilevel inverter. Also indicate the magnitudes of the space vectors. **07**

- (b) What factors lead to deviation of neutral-point voltage? How can this deviation be minimized in a three level diode clamped inverter? **07**
- OR**
- Q.4** (a) Discuss the working of Switched Capacitor-Thyristor Controlled Reactor, with neat diagrams, for VAR compensation. **07**
- (b) Write a brief note on UPFC converter. **07**
- Q.5** (a) Compare the various carrier based modulation schemes for cascaded H-bridge inverter. **07**
- (b) Write a brief note on the features needed for power converters used for solar photovoltaic systems. **07**
- OR**
- Q.5** (a) Draw a one line diagram of an HVDC transmission system for interconnecting two ac systems. Also explain the functions of each component involved in it. **07**
- (b) Explain with block diagram the scheme for instantaneous VAR compensation. How does this method differ from that of Fixed Capacitor-Thyristor Controlled Reactors ? **07**
