

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VII • EXAMINATION – SUMMER 2013

Subject Code: 171002**Date: 24-05-2013****Subject Name: Power Electronics****Time: 02.30 pm - 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) Define following terms. **08**
 (i) Holding current (ii) Latching current (iii) Reverse recovery charge (iv) Turn off time.
- (b) Draw the symbols, V-I characteristics and give one application of following devices: **06**
 i) IGBT ii) GTO iii) TRIAC
- Q.2** (a) Explain operation of series-connected thyristors in detail **07**
 (b) Nine thyristors are used in a string to withstand a DC voltage of $V_s = 15$ KV. The maximum leakage current and recovery charge differences of thyristors are 10 milli-ampere and 150 micro-C respectively. Each thyristor has a voltage sharing resistor of $R = 56$ kilo-ohm and capacitance of $C = 0.5$ micro-F. Determine (i) The maximum steady state voltage sharing (ii) The steady state voltage-derating factor (iii) maximum transient voltage sharing and (iv) The transient voltage - derating factor. **07**
- OR**
- (b) Discuss following in detail: **04**
 (1) Parallel operation of thyristor **03**
 (2) di/dt protection circuits of thyristor.
- Q.3** (a) Draw the circuit arrangements for the Single Phase full converter with Resistive load. Derive expression for the average output voltage and RMS output voltage. Sketch the voltage and current waveforms. **07**
- (b) For a single phase half converter with purely resistive load and delay angle $\pi/3$, determine (i) the rectification efficiency, (ii) the form factor (FF), (iii) the ripple factor (RF), (iv) the TUF, and (v) the PIV of thyristor. **07**
- OR**
- Q.3** (a) Draw the circuit arrangements for the Three Phase half-wave converter. Derive expression for the average output voltage and RMS output voltage. Sketch the voltage and current waveforms. **07**
 (b) Describe various ways to turn on thyristor. **07**
- Q.4** (a) List and explain performance parameters of an inverter. **07**
 (b) Explain Buck regulator with circuit diagram and waveforms. **07**
- OR**
- Q.4** (a) Describe the working of a single phase full bridge inverter with diagram and waveforms. **07**

Q.4 (b) Explain principal of step-up chopper with circuit diagram, current and output voltage wave-forms. **07**

Q.5 (a) Discuss second quadrant (Type –B) chopper with circuit diagram and waveform. **07**

(b) List all categories of Switched mode Power Supply and discuss any one in detail. **07**

OR

Q.5 (a) Explain three-phase bridge Inverter for 120^0 conduction with waveform. **07**

(b) Draw and explain Uninterruptable Power supply and explain battery charging mechanism in it. **07**
