

**GUJARAT TECHNOLOGICAL UNIVERSITY****B. E. - SEMESTER – VII • EXAMINATION – WINTER 2012****Subject code: 170801****Date: 26/12/2012****Subject Name: Power Electronics and Industrial Drives****Time: 10.30 am - 01.00 pm****Total Marks: 70****Instructions:**

1. Attempt any five questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Draw and explain the structure of power MOSFET. Also explain principal of operation and I-V characteristics of power MOSFET. **07**
- (b) Draw the I-V characteristics of the following: **07**
1. Power diode      2. SCR      3. BJT  
4. IGBT      5. MCT      6. GTO      7. SIT
- Q.2** (a) Draw and explain full wave controlled rectifier with the inductive load using required waveforms and equations. **07**
- (b) The three phase full wave rectifier has a load of  $L=1.5 \text{ mH}$ ,  $R=2.5\Omega$  and  $E=10 \text{ V}$ . The input voltage is  $V_{in}=208\text{V}$ ,  $60 \text{ Hz}$ . Determine **07**
1. The steady state load current  $I_o$  at  $\omega t=\pi/3$   
2. The average diode current  $I_o$   
3. The rms diode current  $I_r$   
4. The rms output current  $I_{rms}$ .
- OR**
- (b) Draw and explain three phase half wave controlled rectifier with required waveforms and equations. **07**
- Q.3** (a) Classify the power factor improvement methods for phase controlled rectifiers. Explain any one. **07**
- (b) Explain single phase bridge inverter. **07**
- OR**
- Q.3** (a) Discuss operation of half bridge inverter with resistive load. Derive the equation of instantaneous output voltage. **07**
- (b) Explain techniques of voltage control of single phase inverter. Explain single pulse width modulation. **07**
- Q.4** (a) Explain DC-DC converter drives. **07**
- (b) Explain three phase cycloconverter and sinusoidal harmonic reduction techniques for cycloconverter. **07**
- OR**
- Q.4** (a) Discuss operation of three phase inverter in  $180^\circ$  mode of conduction. **07**
- (b) What is DC drive? Discuss basic characteristics of DC motors. **07**
- Q.5** (a) Explain induction motor drives. **07**
- (b) Discuss about choice of AC and DC drive in detail. **07**
- OR**
- Q.5** (a) Classify synchronous motor drives. Explain brushless DC and AC motor. **07**
- (b) Explain control modes of DC-DC converter drive. **07**

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