Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

**M.E –I$^{st}$ SEMESTER–EXAMINATION – JULY- 2012**

**Subject code: 710702N** **Date: 07/07/2012**

**Subject Name: Advanced Power Electronics**

**Time: 2:30 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.**

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|---|---|---|---|
| Q.1 | (a) | Discuss different constructional features of GTO'S with switching characteristics curves, and explain relative comparison of GTO'S and SCR. | 07 |
| | (b) | Describe the necessity of Isolation of gate and Base drives and explain how they are implemented using the pulse transformer and Opto Isolator with necessary circuit diagrams. | 07 |
| Q.2 | (a) | What is PWM Inverter principle? List the different pulse width modulation techniques used for inverters? Describe Multiple Pulse Modulation technique of PWM inverter with necessary waveforms and harmonic spectrums. | 07 |
| | (b) | Describe the phase angle control techniques for AC Voltage controllers and Derive the expression for rms and average value of output voltage for 1-Ø half wave AC voltage controller. | 07 |
| | | **OR** | |
| | (b) | With neat circuit and waveforms explain three phase current source transistorized Inverter and compare with voltage source inverter. | 07 |
| Q.3 | (a) | Explain the principle of operation of three phase bridge inverter with 150 ° conduction mode with necessary circuit diagram and waveforms. | 07 |
| | (b) | What is switching mode regulator? List the basic types of switching mode regulators. Explain in brief Forward converter with necessary circuit diagram and waveforms. | 07 |
| | | **OR** | |
| Q.3 | (a) | Draw the neat circuit diagram of three phase full wave bidirectional AC Voltage controller and explain it's working with waveforms for different firing angles. | 07 |
| | (b) | The three phase full wave controller supplies a star connected resistive load of R = 10 Ω and the line –to line input voltage is 208 volt ( rms ), 60 Hz. The delay angle is $\alpha = \pi/3$. Determine (a) The RMS output voltage Vo (b) The input power factor and (c) the expression for the instantaneous output voltage of phase a. | 07 |
| Q.4 | (a) | Give different circuit configurations for base drive of BJT. | 07 |
| | (b) | Explain the various protection circuits against dv/dt, di/dt and overvoltage in the driver circuit of power devices. | 07 |
| | | **OR** | |

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|---|---|---|---|
| Q.4 | (a) | Discuss various harmonics reduction techniques in the Inverter output with necessary sketches | 07 |
| | (b) | Describe Buck converter and obtain necessary derivations for continuous mode of conductions. | 07 |
| Q.5 | (a) | Explain with neat circuit diagram and waveforms the principle of operation of three phase half wave cyclo converters with circulating current mode and discuss the advantages of circulating current mode.. | 07 |
| | (b) | Discuss salient features of IGBT with it's transfer characteristics | 07 |

**OR**

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|---|---|---|---|
| Q.5 | (a) | Explain operation of Multi output switch mode regulator with circuit diagram and timing diagram. | 07 |
| | (b) | Describe the high frequency transformer design for fly back converter with it's topology and waveforms. | 07 |

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