Seat No.: _____ Enrolment No._____

# GUJARAT TECHNOLOGICAL UNIVERSITY

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

**Subject code: 714501N** **Date: 05/07/2012**

**Subject Name: Power Electronics-I**

**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)** | Explain the vertical cross section of power MOSFET. | **07** |
| | **(b)** | Explain the push-pull converter with neat circuit diagram and draw all the waveform related to the circuit. | **07** |
| **Q.2** | **(a)** | Explain Buck-Boost Converter and derive its Average & RMS Output Voltage Equation. | **07** |
| | **(b)** | Explain Full Bridge Forward converter and Derive its Average Output Voltage Equation. | **07** |
| | | **OR** | |
| | **(b)** | For the 1-phase Half bridge Forward inverter has a resistive load of R=100 Ω and dc input voltage is 100 volt. Determine: (i) the RMS output voltage at the fundamental frequency, (ii) the output power Po, (iii) the average, RMS and Peak current through each transistor, (iv) THD. | **07** |
| **Q.3** | **(a)** | Explain 3-phase bridge inverter in 180 degree conduction mode and draw it's output phase and line voltage wave form with resistive load. | **07** |
| | **(b)** | Explain Sinusoidal PWM technique in detail. | **07** |
| | | **OR** | |
| **Q.3** | **(a)** | Explain advantage and disadvantage of PWM technique. | **07** |
| | **(b)** | What is an ideal power semiconductor switch? State the requirements of gate driver circuit for MOSFET. | **07** |
| **Q.4** | **(a)** | Explain the parallel operation of SCR. Discuss the equalizing methods for smooth parallel operation. | **07** |
| | **(b)** | Describe the operation of single phase full-wave A.C. Voltage regulator with R load with the help of voltage and current waveforms. Also, derive expression for RMS value of output voltage. | **07** |
| | | **OR** | |
| **Q.4** | **(a)** | Design dynamic equalizing network for proper operation of series connected SCR. | **07** |
| | **(b)** | With neat and clean waveform explain the principle of phase control. | **07** |
| **Q.5** | **(a)** | Explain the needs of Heatsink. Explain its selection process. | **07** |
| | **(b)** | Explain the steps to design an inductor for converter application. | **07** |
| | | **OR** | |
| **Q.5** | **(a)** | Explain the six pulse diode converter supplying resistive load. | **07** |
| | **(b)** | Explain the changes required in power diode design to increase its voltage withstand capacity as compared to signal diode. | **07** |

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