| Seat N   | o.:   | Enrolment No  GUJARAT TECHNOLOGICAL UNIVERSITY  M.E –I <sup>st</sup> SEMESTER–EXAMINATION – JULY- 2012  | _        |  |
|--|---|---|----------|--|
| Subje<br>Time<br>Instr   | ubject code: 712907N  ubject Name: Power Devices & Applications ime: 2:30 pm – 05:00 pm  Total Marks instructions:  1. Attempt all questions. |   |          |  |
| <ol> <li>Make suitable assumptions wherever necessary.</li> <li>Figures to the right indicate full marks.</li> </ol> |   |   |          |  |
| Q.1  | (a)<br>(b)  | Explain the Concept Of Safe Operating Area with necessary waveforms. Explain in detail the Characteristics of Ideal Switch.   | 07<br>07 |  |
| Q.2  | (a)   | What is the disadvantage of Power Transistor? Explain step-down convertor with necessary waveforms.   | 07       |  |
|  | <b>(b)</b>  | Analyze the performance of SCR using two transistors Analogy. Derive it's expression for it's anode current in terms of current gain ' $\beta$ ' and leakage current $I_{co}$ .   | 07       |  |
|  | <b>(b)</b>  | Define Commutation. Draw & explain Class-E commutation circuit.   | 07       |  |
| Q.3  | (a)   | Draw schematic diagram and symbol of IGBT. Explain in detail the operation of IGBT.   | 07       |  |
|  | <b>(b)</b>  | Compare various types of firing circuits.  OR   | 07       |  |
| Q.3  | (a)   | An SCR has $V_g$ - $I_g$ characteristics given as $V_g$ =2+9 $I_g$ . In a certain application, the gate voltage consists of rectangular pulses of 18V and of duration 75 $\mu$ s with duty cycle 0.35. Find out the value of $R_g$ series resistor in gate circuit to limit the peak power dissipation in the gate to 3 watts. Calculate average power dissipation in the gate. | 07       |  |
|  | <b>(b)</b>  | Draw & explain Typical UJT V-I characteristic curve. Derive the expression for frequency of triggering and firing angle delay in terms of $\eta$ , charging resistance etc.   | 07       |  |
| Q.4  | (a)<br>(b)  | Design the PUT-30 minute time delay circuit.  Draw & explain the power circuit of Ideal Zero voltage switch with neat sketches.   | 07<br>07 |  |
| Q.4  | (a)<br>(b)  | OR Compare SUS and SBS in tabular forms. Write a detailed note on Electronic timer.   | 07<br>07 |  |
| Q.5  | (a)<br>(b)  | Enlist & explain the various types of Convertor.  Explain in detail Light-dimmer control.  OR   | 07<br>07 |  |
| Q.5  | (a)   | Draw an overvoltage protection circuit using thyristor and discuss it's working.  | 07       |  |
|  | <b>(b)</b>  | Draw & explain the block diagram of UPS systems. Also list out the applications of UPS systems.   | 07       |  |

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