

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VII (NEW) - EXAMINATION – SUMMER 2017****Subject Code: 2172410****Date: 09/05/2017****Subject Name: Power Electronics Design****Time: 02.30 PM to 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) Discuss the steps in engineering design process for power electronics with appropriate example. **07**
 (b) Explain the base driver circuit for power BJT with neat diagram. **07**
- Q.2** (a) Discuss the use of isolated driver circuit for power switch component in converter with illustration. **07**
 (b) Explain basic driver circuit for MOSFET. Discuss its limitation. **07**
- OR**
- (b) The maximum junction temperature of a bipolar junction transistor (BJT) is $T_{jmax} = 150^\circ \text{C}$ and the maximum power dissipation is 2.0 W at ambient temperature $T_A = 25^\circ \text{C}$ and 40W at case temperature $T_c = 25^\circ \text{C}$.
 (1) Calculate the maximum allowable power dissipation of the transistor operating in ambient temperature of 50°C in free air environment.
 (2) Calculate the maximum allowable power dissipation of the transistor operating with heat sink that has sufficient large area and with fan forcing convection.
- Q.3** (a) Write a short note on SCR ratings. **07**
 (b) Calculate the frequency of UJT based relaxation circuit for triggering the SCR with the following parameters: **07**
- Resistance $R_T = 10 \text{ k}\Omega$, capacitance $C_T = 0.1 \mu\text{F}$, valley potential = 1.5 V, $V_{BB} = 20 \text{ V}$, diode cut-in voltage = 0.7 V, stand-off ratio $\eta = 0.6$
- OR**
- Q.3** (a) Describe the function of PUT with suitable example circuit. How, it differs from UJT. **07**
 (b) Write a short note on PCB design for mixed signal (analog and digital) circuit. **07**
- Q.4** (a) Discuss thermal modeling of power switching devices with mathematical equivalent circuit and neat diagram. **07**
 (b) Write a detailed note on Over voltage protection in power electronics circuit with appropriate example. **07**
- OR**
- Q.4** (a) Discuss the steps for design of low frequency Transformer with appropriate example. **07**
 (b) Write a short note on design Considerations for Voltage Isolation and Current Capacity for PCB design. **07**
- Q.5** (a) An Inductor is to be designed for L-C filter circuit used with AC to DC rectifier for the purpose of filtering the output of rectifier. Discuss the design considerations for inductor design with suitable example. **07**
 (b) Discuss di/dt and dv/dt protection for SCR with design consideration. **07**

OR

- Q.5** (a) Write a detailed note on single layer PCB design with suitable example. **07**
(b) Discuss high frequency design of Inductor for DC-DC converter circuit with appropriate example. **07**
