Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 08

M.Tech.(EPDT) (2016 & Onwards) (Sem.–1)

DESIGNING WITH POWER DEVICES

Subject Code : MTET-105

Paper ID : [74139]

Time : 3 Hrs. Max. Marks : 100

INSTRUCTION TO CANDIDATES :

1. **Attempt any FIVE questions out of EIGHT questions.**
2. **Each question carries TWENTY marks.**

Q1. a. With the help of suitable diagram, explain the switching, output, and transfer characteristics of an IGBT. How does latch-up occur in an IGBT?

b. Write the definition of *uncontrolled, semi-controlled, and fully controlled* power switches. Write the characteristic of an ideal power switch that can be used as a reference to evaluate practical switches.

Q2. Explain the design procedure of pulse and high frequency transformers in detail using suitable diagram and proper mathematical expressions. Also, discuss the issue of selection of proper core material, insulating material and wires.

Q3. With the help of proper mathematical expression and suitable circuit diagram, explain the operation of a buck boost and flyback converter in continuous and discontinuous current modes.

Q4. Describe the basic working principle of UPS with the help of block diagram. State the application and the advantages of UPS. What is the difference between *lines preferred* UPS, *inverter preferred* UPS, and *line interactive* system? Explain in detail.

Q5. A buck regulator has an input voltage of 12 V_{dc}, and produces a load voltage of 5 V_{dc} into a 10 Ω load. Its switch is driven at 100 kHz. The inductor is 220 μH. Calculate the following: duty cycle, on time, ripple current, average inductor current, and peak inductor current.

Q6. a. How will the output and losses in transformer vary with linear dimensions? How the area of core is affected by weight of copper and iron?

b. Why circular coils are preferred in transformer winding? What is the basic difference between the coils of inductors used for power, radio and high frequency?

Q7. a. What is pulse width modulation (PWM)? Explain how PWM is used in control section of SMPS.

b. What is the difference between PWM based control and resonance based control section used in power supplies? Discuss the design issues of protection circuit of SMPS.

Q8. Write a short notes on :

a. SMPS

b. GTOs

c. Cuk converter

d. Modified McMurray Half-bridge converter.