Total number of printed pages: 2

DIPLOMA (D) / V / DIE504

2024

POWER ELECTRONICS

Full Marks: 100

Time: Three hours

The figures in the margin indicate full marks for the questions.

*Answer all **five** questions.*

1. a) Answer the following questions in brief- 10 X 2 = 20

   i) "The resistance of a semiconductor is dependent on temperature." Justify.

   ii) Define the term "drift region" in power semiconductor devices.

   iii) What is a semi-controllable semiconductor switch?

   iv) Define Softness Factor of a diode.

   v) Why is BJT called a bipolar device?

   vi) What do you mean by Holding current of a thyristor?

   vii) What is the relation between ∞ and β of a transistor?

   viii) Define the term "Duty Cycle".

   ix) What is the turn-on voltage of a PUT?

   x) Name any two applications of a thyristor.

2. a) Briefly explain the reverse recovery characteristic of a diode with a suitable diagram. 4

   b) Explain the different modes of operation of an SCR with the help of its static I-V characteristics. 6

   c) Draw the diagram of a POWER MOSFET and briefly explain how it is turned ON. 5

   d) State the different methods of turning ON a thyristor. 5

3. a) What is a firing circuit? Draw the circuit diagram of Resistance firing circuit of a thyristor and show the relation between the firing angle, 2 + 6 + 2 = 10

resistances and Gate turn-on voltage. Why is the firing angle of Resistance based circuit limited to 90°?

b) State the intrinsic stand-off ratio of a Unijunction transistor. 2

c) With the help of voltage and current waveforms, explain the working of a single-phase half-wave circuit with R-L-E load. 8

4. a) What is the main function of a DC chopper? Deduce the output voltage expression for an elementary chopper circuit. 6

b) Draw the circuit diagram and waveforms of a diode circuit with R-C load. 6

c) Define the terms i) Delay time (td), ii) Rise time (tr), iii) Spread time (tp) and iv) turn-off time (tq) of a thyristor during switching. 4 X 2 = 8

5. a) Write short notes on any four. 5 X 4 = 20

i. GTO ii. Triac iii. IGBT iv. PUT

v. BJT as a switch vi. Two transistor model of thyristor