HILL UNIVERSITY
Established by an Act of the State Legislature of Uttarakhand (Adhiniyam Sankhya 12 of 2011)
University under section 2(f) of UGC Act, 1956

Term Evaluation (Odd) Semester Examination September 2025

Roll no.....

Name of the Course:B.Tech
Semester: III
Name of the Paper: Electronic Devices and Circuits
Paper Code: TEC 301
Time: 1.5 hour **Maximum Marks: 50**

Note:
(i) Answer all the questions by choosing any one of the sub-questions
(ii) Each question carries 10 marks.

Q1. (10 Marks) (CO1)
a. Explain the formation of energy band diagrams in materials and classify the materials based on energy band diagram.

OR

b. Explain the formation of n type and p type semiconductors. Establish a relation between charge densities in both n type and p type semiconductors.

Q2. (10 Marks) (CO1)
a. What is conductivity and mobility. Derive an expression for drift current density in conductors.

OR

b. What is the Hall effect? Derive the expression for the Hall coefficient and discuss its applications in semiconductor device characterization.

Q3. (10 Marks) (CO1/CO2)
a. A sample of Ge has intrinsic charge carrier density of $2.0 \times 10^{10}/m^3$. If it is doped with donor impurity of 1 atom in every 10^7 Ge atom. If the Ge atom density id $4.0 \times 10^{28}/m^3$, then determine the majority and minority charge carriers as well as conductivity and resistivity of the doped semiconductor. Given that the mobility of free electrons and holes is $0.35 m^2/V\text{-sec}$ and $0.16 m^2/V\text{-sec}$ respectively.

OR

b. Explain the formation of depletion region in PN junction diode. What is junction capacitance. Explain diffusion capacitance in detail.

Q4. (10 Marks) (CO2)
a. Explain the working of PN junction diode in forward and reverse biasing. Explain the V-I characteristics of junction with the help of a diagram.

OR

b. Explain the working of clipper and clamper circuit with the help of a diagram.

Q5. (10 Marks) (CO2)
a. What is Zener breakdown. Explain the use of Zener diode as voltage regulator in a circuit with fixed load and supply voltage.

OR

b. Describe the small signal model of PN junction in detail. Explain the working of LED with a neat diagram.