(Deemed to be University under section 3 of UGC Act, 1956)

SCHOOL OF ELECTRONICS
CONTINUOUS ASSESSMENT TEST - 1
WINTER SEMESTER 2025-2026

SLOT: A2+TA2

Programme Name & Branch : B.Tech. Electronics Engineering(VLSI Design and Technology)
Course Code and Course Name : BAEVD101 & Electronic Devices
Class Number (s) : VL2025260500815
Faculty Name (s) : Dr. Shelja
Exam Duration : 90 Min. **Maximum Marks: 50**

General instruction(s):

- Answer All Questions
- M - Max mark; CO – Course Outcome; BL – Blooms Taxonomy Level (1 – Remember, 2 – Understand, 3 – Apply, 4 – Analyse, 5 – Evaluate, 6 – Create)
- Course Outcomes: Employ the semiconductor fundamentals to homo- and hetero-semiconductor junctions and electronic devices

Q.No.	Question	M	CO	BL
1.	a) The steady-state electron distribution in silicon can be approximated by a linear function of x. The maximum electron concentration occurs at x = 0 is n(0) = 2 x 10^{16} cm^{-3}. At x = 0.012 cm, the electron concentration is 5 x 10^{15} cm^{-3}. If the electron diffusion coefficient is D_n = 27 cm^2/s, determine the electron diffusion current density.	5	CO1	BL3
	b) A compensated p-type silicon material at T = 300 K has impurity doping concentrations of N_a = 2.8 x 10^{17} cm^{-3} and N_d = 8 x 10^{16} cm^{-3}. Determine the (a) conductivity and (b) resistivity.	5	CO1	BL3
2.	Silicon at T = 300 K is doped with boron atoms such that the concentration of holes is p_0 = 5 x 10^{15} cm^{-3} . (a) Find E_F -E_V. (b) Determine E_C -E_F. (c) Determine n_0. (d) Which carrier is the majority carrier? Assume : $N_V = 1.04 \times 10^{19}\ cm^{-3}$, $N_C \approx 2.8 \times 10^{19}\ cm^{-3}$, $E_g \approx 1.12$ eV and $kT = 0.0259$ eV.	10	CO1	BL3
3.	A silicon p–n junction diode has a junction area of $10^{-4}\ cm^2$. The acceptor and donor concentrations are $N_a = 10^{17}\ cm^{-3}$ and $N_d = 10^{17}\ cm^{-3}$, respectively. The electron mobility is $\mu_n = 1500\ cm^2/V$, the hole mobility is $\mu_p = 450\ cm^2/V$, and the carrier lifetimes are $\tau_n = \tau_p = 2$ ns (a) Determine the reverse saturation current of the diode. (b) If the diode has an ideality factor $\eta = 1.5$ and is forward biased at 0.2 V, calculate the forward current.	10	CO1	BL3
4.	Explain the breakdown characteristics of a p–n junction diode under reverse bias and differentiate between Zener breakdown and avalanche breakdown with the help of a neat diagram.	10	CO1	BL2
5.	Draw and explain the graph showing the variation of diode capacitance with applied voltage. Also, explain diffusion capacitance in a p–n junction diode and derive its expression.	10	CO1	BL2