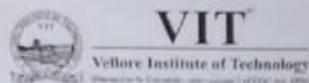


Reg. No.:

Name :



Continuous Assessment Test – I – March 2023

Programme	: B.Tech (ECE/ECM)	Semester	: Winter 2022-23
Course	: Electronic Materials and Devices	Code	: BECE201L
Faculty	: Dr Chandrasekaran N Dr. Deepak Punetha Dr. Rahul Narasimhan Dr. M Saranya Nair Dr Ashish Kumar	Slot	: E1+TE1
Time	: 90 Minutes	Class Nbr(s)	: CH2022232300101 CH2022232300102 CH2022232300103 CH2022232300104 CH2022232300105
		Max. Marks	: 50

Answer ALL the questions

Q.No.	Sub. Sec.	Question Description	Marks
1		Consider the BCC unit cell of the Chromium crystal. The radius of Cr atom is 0.130nm and the atomic mass of Cr is 51.99 g/mol. a) How many atoms are there per unit cell? [2] b) Determine the expression for lattice parameter, a, in terms of atomic radius, R of Cr. [3] c) Calculate the Atomic Packing Factor (APF). [3] d) Calculate the atomic concentration (number of atoms per unit volume). [2]	[10]
2		Illustrate the defect induced because of differences or inconsistencies from the ideal arrangement around a point or an atom in a crystalline solid. Based on atomic structure, comprehend Schottky, Interstitial, and Frenkel Defects.	[10]
3		a) For an applied voltage of 5mV along X-axis, a current of 10 mA flows through a metal of length 0.1m and width 0.01m. Further a magnetic field (B_y) of 0.3 Tesla is applied along the Y axis. An induced voltage of 0.5mV is observed along the direction of Lorentz Force on free electrons. Find the total number of electrons per unit volume of the metal. (v_{dx} = drift velocity along X axis) [5] b) Derive the current density of a metal using Drude's model. Also explain the difference between the mean speed and the drift velocity. [5]	[10]
4		Suppose we want to perform doping on "Ge" Wafer, explain what (and why) criteria should be followed for the selection of dopant elements? Discuss in brief the impact of donor / acceptor doping on the Fermi level (E_F). Explain your answer with the help of energy band-diagrams.	[10]
5		Calculate the density of impurity atoms that must be added to an intrinsic Silicon crystal to convert it to :- a) $10^{-4} \text{ ohm} - m$ n-type Silicon [5] b) $10^{-4} \text{ ohm} - m$ p-type Silicon [5] The electron and hole mobilities for Silicon are $\mu_e = 0.138 \text{ } m^2 \text{ } V^{-1} \text{ } s^{-1}$ and $\mu_h = 0.046 \text{ } m^2 \text{ } V^{-1} \text{ } s^{-1}$.	[10]
		*****	Total Marks [50]