Reg. No.:

Name :

VIT

Vellore Institute of Technology

Continuous Assessment Test – I – March 2023

Programme	:	B.Tech (ECE/ECM)	Semester	:	Winter 2022-23
Course	:	Electronic Materials and Devices	Code	:	BECE201L
			Slot	:	E1+TE1
Faculty	:	Dr Chandrasekaran N Dr. Deepak Punetha Dr. Rahul Narasimhan Dr. M Saranya Nair Dr Ashish Kumar	Class Nbr(s)	:	CH2022232300101 CH2022232300102 CH2022232300103 CH2022232300104 CH2022232300105
Time	:	90 Minutes	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 ($\mathbf{B}_y$) 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. ($\mathbf{v}_{dx}$ = 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) $10^{-4}\ ohm-m$ n-type Silicon **[5]** b) $10^{-4}\ ohm-m$ p-type Silicon **[5]** The electron and hole mobilities for Silicon are $\mu_e = 0.138\ m^2\ V^{-1}s^{-1}$ and $\mu_h = 0.046\ m^2\ V^{-1}s^{-1}$.	**[10]**
		Total Marks	**[50]**

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