Name: **Enrolment No:**	

UPES

End Semester Examination, December 2023

Course: Fundamental of Material Science **Semester: V**

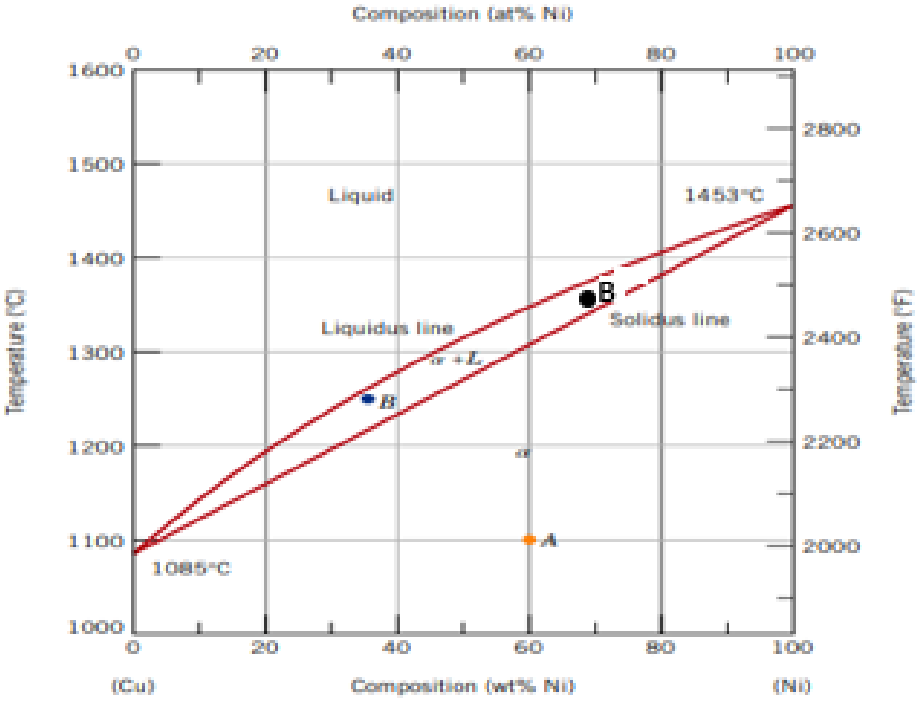
Program: Int. B.Sc.-M.Sc Physics **Time : 03 hrs.**

Course Code: PHYS 3038 **Max. Marks: 100**

Instructions: 1. All questions are compulsory.

SECTION A
(5Qx4M=20Marks)

S. No.		Marks	CO
Q 1	How does the coercivity of a magnetic material relate to its hysteresis loop?	**4**	**CO2**
Q 2	Draw the Fermi energy level diagram for P and N type Semiconductor.	**4**	**CO3**
Q 3	"The probability of the formation of self-interstitial defect is very small". Explain.	**4**	**CO2**
Q 4	What is dielectric breakdown, and how does it limit the maximum voltage a dielectric can withstand?	**4**	**CO2**
Q 5	"Metals are opaque to all electromagnetic radiation on the low end of the frequency spectrum". Explain.	**4**	**CO3**
	SECTION B **(4Qx10M= 40 Marks)**		
Q 6	Calculate the current produced in a silicon crystal with a cross-sectional area of 3 cm^2 and a length of 0.6 mm when a potential difference of 2.0 V is applied. Given that the concentration of free electrons in the silicon crystal is 1.5 x 10^{19} m^{-3}, and the electron mobility is 0.25 $m^2 \cdot V^{-1} \cdot s^{-1}$.	**10**	**CO4**
Q 7	What happens to light when it strikes a transparent material and undergoes refraction? How does this relate to the material's optical properties?	**10**	**CO3**
Q 8	Calculate the number of atoms per unit cell of a metal having a lattice parameter 0.29 nm and density of 7870 kg/m^3. Atomic weight of the metal is 55.85.	**10**	**CO2**
Q 9	What is a phase diagram, and what is its primary purpose in materials science and thermodynamics? OR	**10**	**CO2**

	Compute the fraction of the α and the liquid at point B from the Cu-Ni phase diagram.  		
	SECTION-C **(2Qx20M=40 Marks)**		
Q 10	(a) Describe the concept of edge dislocations and screw dislocations in crystal structures. (b) A paramagnetic material contains 8.7 x 10^{26} ions/m^3 with magnetic moment $0.3\mu B$. Calculate the magnetization under the action of a magnetic induction of 1.5 Tesla at 300K.	**10** **10**	**CO2** **CO4**
Q 11	Show that the spontaneous magnetization in a ferromagnetic material exists for temperatures below the Curie point T_c. OR Deduce an expression for the maximum angular frequency for the acoustical branch during the motion of atoms of diatomic 1D crystal.	**20**	**CO1**