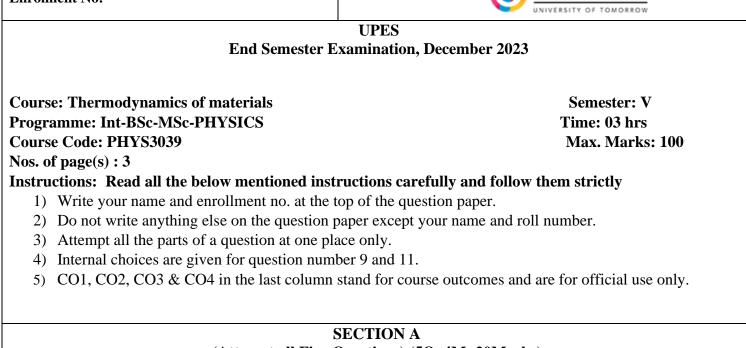
Name:

Enrolment No:



	(Attempt all Five Questions) (5Qx4M=20Marks)		
S. No.		Marks	CO
Q 1	A system consists of gaseous H ₂ , O ₂ , H ₂ O and CO ₂ where amount of CO ₂ is specified and equilibrium constant for the reaction $2H_2(g)+O_2(g) \rightleftharpoons 2H_2O(g)$ is known. Find the number of degrees of freedom.	4	CO1
Q 2	Suppose we know that $\Delta G^0 = +200$ J/mol for the reaction A (g) + B(s) \rightarrow C (g) at 25°C. Δ H and Δ S of the reaction are 20 kJ/mol and 66.44 J/K/mol respectively. Calculate the temperature at which the reaction will be spontaneous.	4	CO1
Q 3	Explain the Fick's law.	4	CO2
Q 4	Draw and compare the phase diagram of water and CO ₂ .	4	CO2
Q 5	A liquid has vapour pressure of 1200 mmHg at 293 K and heat of vaporization is 41 kJ/mole. Calculate the boiling point of the liquid. Given: $R = 8.314$ J/K/mol.	4	CO3
	SECTION B		
	(Attempt all Questions; internal choice is given for question number 9) (4Qx10M=	40 Marks)
Q 6	 (a) Draw and discuss the phase diagram of one component system which exist in two polymorphs. (b) Derive all the Maxwell's thermodynamic equation using Euler's reciprocity theorem. 	6+4	CO2
Q 7	theorem.(a) Draw and label the phase diagram of FeCl ₃ -H ₂ O system.	5+5	CO2



	 (b) Check whether the following reaction is spontaneous at 25 °C and 1000 °C C(s) + H₂O(l) → CO (s) + H₂ (g). Given that ΔH and ΔS are 31400 Cal/mol and 32 Cal/deg at 25 °C. 		
Q 8	(a) Explain Hume Rothery rules with suitable examples.(b) What are the advantages and experimental evidences of two metals forming a solid solution?	10	CO3
Q 9	 (a) Define peritectic temperature with a suitable example. Draw and label a phase diagram of a two-component system which undergoes peritectic reaction. 	5+5	
	OR		CO3
	Draw and discuss the phase (T-C) diagram of a liquid vapour system.		
	 (b) State Raoult's law and Henry's law. Under what conditions the two laws behave similar? Draw a P-C diagram for an ideal liquid-vapour system. OR 		
	Derive the Gibbs-Duhem equation.		
	SECTION-C		
Q10	(Attempt all Questions; internal choice is given for question number 11) (2Qx20M= (a) What is simple eutectic system? Draw a phase diagram for a simple eutectic	40 Marks	()
QIU	system. Show how to use the Lever rule to find the ratio of number of moles of solid and liquid present in a two-component solid-liquid equilibrium system.	8+12	CO4
Q 11	(b) Derive Clausius - Clapeyron Equation.(a) Explain Kirkendall effect and kinetics of defect diffusion.		
ųπ	(a) Explain Kirkendan effect and kinetics of defect diffusion. OR		
	Calculate the entropy change for transformation $I_2(s, 1 \text{ atm}, 298 \text{ K}) \rightarrow I_2(v, 1 \text{ atm}, 457 \text{ K})$, Given that: $\Delta H_{\text{fus,m}} = 15.68 \text{ kJ/mole}$ at the melting point 113.6°C, $\Delta H_{\text{vap,m}} = 25.52 \text{ kJ/mol}$ at the boiling point 184°C.	10+10	CO4
	$C_{p,m}(I_2,s) = 54.6 + 13.4 \times 10^{-4} \text{ T Joule/mole/K}, C_{p,m}(I_2, l) = 81.5 \text{ Joule/mol/K}$		
	(b) Draw a well labelled triangular phase diagram of water-chloroform-acetic acid system and explain the various regions in it.		
	OR Draw the phase diagram for a solid solution. Using Lever rule derive an expression for the relative amount of solid and liquid phases.		