Question Paper

Exam Date & Time: 26-Dec-2022 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATION - DECEMBER 2022
III SEMESTER B.Sc. (Applied Sciences) in Engg.

MATERIAL SCIENCE AND ENGINEERING [IMET 233 - S2]

Marks: 50 **Duration: 180 mins.**

Answer all the questions.

Missing data, if any, may be suitably assumed

1)		Define Miller indices. List the steps involved in finding miller indices for planes and directions.	(4)
	A)		
	B)	Calculate atomic packing factor of BCC unit cell.	(3)
	C)	Sketch Edge and Screw dislocations and highlight the differences.	(3)
2)		Explain dendritic growth related to solidification of metals.	(4)
	A)		
	B)	Sketch the cooling curves for alloys and pure metals and explain the importance of supercooling.	(3)
	C)	Write Gibb's phase rule and explain the terms involved in it.	(3)
3)		The melting temperatures of Copper (Cu) and Silver (Ag) are 1084.5^{o}C and 961.93^{o}C respectively and they are mutually soluble in the liquid state and partly soluble in the solid state. A liquid phase alloy containing 71.9% Ag completely transforms into a mixture of two solid solutions at 780^{o}C. Maximum solubilities of Cu in Ag and Ag in Cu are 8.8% and 7.9% respectively at 780^{o}C and the same can be considered as zero at room temperatures. Assuming the curves to be linear, draw phase diagram to scale and label the regions. For 20% Ag alloy, determine the following: a) Composition of first solid nucleated. b) Temperature where equal proportions of liquid and solid phases exists. c) Composition of last drop of liquid to be precipitated d) Amount of eutectic and pro eutectic phases at room temperature.	(5)
	A)		
	B)	Draw the phase diagram of Iron-Carbon system and briefly explain the properties of: i) ferrite ii) pearlite iii) Cementite iv) Austenite.	(5)

4)	A)	Draw the neat diagram of TTT diagram and show i) furnace cooling ii) air cooling iii) quenching in it.	(3)
	B)	List the characteristics of: i) Thermoplastics ii) Free machining steels	(3)
	C)	Define composites. Explain particulate composites in detail.	(4)
5)	A)	On what way conductivities of alloys are different from pure metals?	(2)
	B)	Explain Spray pyrolysis and Sol-Gel methods of deposition of thin films with diagrams.	(5)
	C)	State the differences between piezoelectric and electrostriction behaviours.	(3)

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