Exam Date & Time: 08-Mar-2021 (02:00 PM - 05:00 PM)



THIRD SEMESTER B.TECH END SEMESTER EXAMINATIONS, MARCH 2021 MATERIAL SCIENCE AND METALLURGY [AAE 2171]

Marks: 50

Duration: 180 mins.

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An	Answer all the questions.					
Ins	Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed					
1)		Sketch neatly and explain any one zero-dimensional and one-dimensional defects.				
			(4)			
	A)		(.)			
	A)	Eveloin the Leasing hands are test for hands we hility				
	Б)	Explain the Johnny hardness test for hardenaointy.	(3)			
	C	Eveloie the even age and store involved in heat treatment				
	C)	Explain the purpose and steps involved in heat treatment.	(3)			
2)		Neatly sketch Iron-Cementite equilibrium diagram. Name and write the reactions				
2)		involved.	(\mathbf{A})			
			(4)			
	A)					
	B)	Explain the following heat treatments with the treatment cycle. a) Hardening b)				
		Annealing.	(3)			
	\mathbf{C}	Neatly sketch the ideal HCP structure and show that the packing factor of an ideal BCC				
	0)	structure is 0.68.	(3)			
			(-)			
3)		Briefly explain the construction procedure & sketch neatly TTT diagram for the				
		eutectoid steel and on the diagram show the cooling path to obtain a lower bainitic	(5)			
	A)	structure.	(0)			
	D)					
	В)	Briefly explain the rules governing the substitutional solid solutions.	(3)			
	(\mathbf{C})	Show the following miller indices on simple subject calls [111] (021)				
	C)	Show the following infiner indices on simple cubical cens. [111] (021).	(2)			
4)		Explain the nucleation step of solidification				
•)			(\mathbf{a})			
			(2)			

B) Explain the following a) Phase rule b) Lever rule. (4)

A)

	C)	With a neat sketch explain the flame hardening process. List and explain the different types of flame hardening.	(4)
5)		With neat sketches explain the following crystal defects. a) Screw dislocation b) Edge dislocation.	(4)
	A)		
	B)	The solidification temperatures of Lead and Tin on equilibrium cooling are 320°C and 230°C respectively. They form a eutectic containing 60% Tin (by weight) at 180°C. The maximum solubilities of Tin in Lead and Lead in Tin at eutectic temperature are 20% and 5% by weight respectively. Similarly, the maximum solubilities of Lead in Tin and Tin in Lead are 3% and 5% by weight respectively at 50°C. Assuming the lines to be linear, draw a phase diagram to the scale and label the phase regions. For 75% Tin alloy, determine the following:	(4)
		i) Weight percentage of the pre-eutectic Tin-rich solid solution formed.	
		ii) Temperature where there are equal proportions of liquid and solid phases exist.	
		iii) Weight ratio of two solid solutions in the eutectic mixture.	
	C)	Define superheating and supercooling.	(2)

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