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Total No of Questions: [12]		SEAT NO. :
[Total No. of Pages : 3]		
S.E.Mechanical/Mech.S/W sem-I (2008 Pattern)		
Metallurgy		
Time: 3 Hours		Max. Marks : 100
Instructions to the candidates:		
1) <i>Answers to the two sections should be written in separate answer books.</i> 2) <i>Neat diagrams must be drawn wherever necessary.</i> 3) <i>Figures to the right side indicate full marks.</i> 4) <i>Use of Calculator is allowed.</i> 5) <i>Assume Suitable data if necessary</i>		
SECTION I		
Q1)	a) Derive an expression of critical resolved shear stress of a single crystal. [4] b) Explain Line Defects with neat sketches. [4] c) Represent the following planes and directions in cubic system: (<i>Any Two</i>) [4] i) (221) ii) [112] iii) (101) d) State and explain strain hardening with reference to cold working. [4]	
OR		
Q2)	a) Differentiate between the following : (<i>Any One</i>) [4] i) Edge and Screw dislocation ii) Slip and Twinning b) Define the following: [4] i) Recovery ii) Recrystallization iii) Dislocation iv) Hot working c) Write procedure to find out the Miller's Indices for planes and directions in cubic system. [4] d) On the basis of Dislocation theory, explain plastic deformation. [4]	
Q3)	a) With respect to Vicker's hardness test write the following: [4] Load, Indenter, Formula, one application b) What is notch sensitivity in impact test? Draw Charpy any two specimens and one Izod specimen showing notch with dimensions. [4] c) Define the following and show it on the stress-strain curve : [4] i) Modulus of Elasticity ii) Modulus of Toughness ii) Modulus of Resilience iv) Strain Hardening Coefficient (n) d) Explain <i>Any Four</i> methods of increasing Fatigue life of components. [4]	
OR		
Q4)	a) Differentiate between the following: (<i>Any One</i>) [4] i) X-ray Radiography and Gamma ray Radiography ii) Eddy current test and Magnaflux test b) Draw and explain typical Creep curve showing three stages of creep. [4] c) Write one applications of following hardness test: [4] i) Durometer ii) Moh's hardness test iii) Poldi hardness test iv) Microhardness test d) Draw self explanatory sketches: [4] i) S-N curve for steel and aluminium ii) Creep fracture and Fatigue fracture	

Q5)	a)	With reference to Fe-Fe ₃ C Equilibrium diagram write the following transformation with reaction, region on the diagram, carbon % and temperature. i) Eutectoid ii) Peritectic transformation	[6]
	b)	Draw microstructures of the following with one application: (<i>Any Two</i>) i) White cast iron ii) High carbon steel iii) Malleable cast iron	[6]
	c)	Explain the factors increasing the strength and hardness of HSLA.	[4]
	d)	Describe any two factors which controls graphitization in cast iron	[2]
OR			
Q.6	a)	Explain effect of following element on properties of steel: i) Cr ii) V iii) W	[6]
	b)	Classify the steels on the basis of : i) Carbon % ii) Degree of deoxidation iii) Depth of hardening	[6]
	c)	Write significance of the following Critical Temperature: (<i>Any Three</i>) i) A ₀ ii) A ₂ iii) A ₃ iv) A _{cm}	[6]
SECTION II			
Q.7	a)	Differentiate between the following: (<i>Any one</i>) i) Liquid and Gas carburizing ii) Flame and Induction hardening	[6]
	b)	Explain transformation products of Austenite.	[6]
	c)	Draw neat label TTT diagram of the following with temp. and %C: i) Martempering ii) Patenting iii) Austempering	[6]
OR			
Q.8	a)	State advantages and limitations of nitriding over carburizing.	[4]
	b)	Differentiate between the following: Annealing and Normalising	[4]
	c)	What is tempering heat treatment? Explain with classification of tempering with temperatures.	[4]
	d)	What is hardenability? Which test is used to measure hardenability? Draw set up and hardenability curve?	[4]
	e)	What is Tool steel? Name any one type of tool steel?	[2]
Q9)	a)	Describe any two methods used for the manufacturing of metal powders.	[4]
	b)	Explain the following terms: i) Impregnation ii) Compacting iii) Green strength	[6]
	c)	What is Equivalent zinc in brass? Explain its significance?	[4]
	d)	Write composition and uses of Babbitt.	[2]
OR			
Q.10	a)	What is season cracking in brass?	[2]
	b)	Write four limitations of Powder Metallurgy process.	[4]
	c)	What is sintering? Is it necessary to use controlled atmosphere during sintering, if yes, why?	[4]
	d)	Give composition and properties of following alloy: (<i>Any Three</i>) i) Gun metal ii) Invar iii) Monel iv) Muntz metal	[6]

Q.11	a)	State any two properties and applications of refractories.	[4]
	b)	Write note on "Shape Memory Alloy".	[4]
	c)	Classify composite materials with diagram and application.	[4]
	d)	Explain the effects of cryogenic temperature on mechanical properties of materials.	[4]
<i>OR</i>			
Q.12	a)	Write applications of Alumina, Aramid, Zirconia, Kevlar	[4]
	b)	Write a note on : i) Dispersion strengthening composites ii) High temperature materials	[8]
	c)	What is SAP? Write one application, properties and class of material.	[4]
