

Total No of Questions: [12]		SEAT NO. : <input type="text"/>
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S.E.Mechanical/Mech.S/W sem-I (2008 Pattern)		
Metallurgy		
Time: 3 Hours		Max. Marks : 100
Instructions to the candidates:		
1) Answers to the two sections should be written in separate answer books. 2) Neat diagrams must be drawn wherever necessary. 3) Figures to the right side indicate full marks. 4) Use of Calculator is allowed. 5) Assume Suitable data if necessary		
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: (Any Two) [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 : (Any One) [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 Any Four methods of increasing Fatigue life of components. [4]	
OR		
Q4)	a) Differentiate between the following: (Any One) [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: (Any Two) 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: (Any Three) i) A ₀ ii) A ₂ iii) A ₃ iv) A _{cm}	[6]
SECTION II			
Q.7	a)	Differentiate between the following: (Any one) 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: (Any Three) 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]
OR			
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]
