	Se	eat No.: Enrolment No	
		GUJARAT TECHNOLOGICAL UNIVERSITY	
		BE - SEMESTER-III • EXAMINATION – SUMMER • 2014	
	Sı	ubject Code: 131904 Date: 04-06-2014	
		ubject Name: Materials Science and Metallurgy	
		ime: 02.30 pm - 05.00 pm Total Marks: 70	
		structions:	
		 Attempt all questions. Make suitable assumptions wherever necessary. Figures to the right indicate full marks. 	
Q.1	(a)	Explain process to be followed for preparation of metallic specimen to see the microstructure under optical microscope. Name only commonly used etchant.	(7)
	(b)	(1) Define following properties of engineering materials. [i] Hardenability [ii] Toughness [iii] Stiffness and [iv] Ductility	(4)
		(2) Draw any three most commonly observed space lattice structure in metallic elements.	(3)
Q.2	(a)	(1) Define Powder metallurgy. Enlist methods of metal power manufacturing.	(3)
	(b)	(2) Discuss any one metal powder manufacturing methods in detail. Discuss importance of knowledge on "Material Science & metallurgy" to mechanical engineers.	(4) (7)
		OR	
	(b)	What is Galvanic series? Explain cathodic protection method for prevention of corrosion.	(7)
Q.3	(a)	Draw iron – iron carbide equilibrium diagram. Show important phases in it. Discuss the phase transformation takes place for the 0.6 % carbon steel from liquid to room temperature. Explain Structure properties relationship of 0.6 % steel at room temperature.	(10)
	(b)	Draw microstructure of [i] Nodular cast iron [ii] eutectoid steel at room temperature along with magnification, etchant used and description of microstructure. OR	(4)
Q.3	(a)	What is solid solution? What are the types? Explain them with neat sketch. Under which condition interstitial solid solution is feasible?	(7)
	(b)	It is require finding out hardenabilty of an alloy steel. Explain procedure to be followed to find out and the equipments required for the same.	(7)
Q.4	(a)	It is required to find out surface defects for the cast product. Which NDT process you will use? Explain basic principle and limitations of the test you have selected	(7)
	(b)	Discuss advantages and limitations of Powder Metallurgy. OR	(7)
Q.4	(a)	Classify different types of cast iron. Why silicon is added to cast iron? Explain the effects of any four alloying elements on the properties of cast iron.	(7)
	(b)	What is the purpose of Heat Treatment? Differential between Annealing and normalizing.	(7)
Q.5	(a)	Enlist case hardening processes. Discuss induction hardening process along with advantages, limitations and any two applications.	(7)
	(b)	Define critical cooling rate of steel. Discuss the TTT diagram with complete labeling. OR	(7)
Q.5	(a) (b)	Enlist copper and its alloys. Explain any two of them along with its properties and use. (1) Differentiate between Austempering and Mertempering.	(7) (3)
	(0)	(2) Differentiate between edge dislocation and screw dislocation.	(4)
