Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (New) EXAMINATION – WINTER 2018

Subject Code: 2131904 Date: 01/12/2018

Subject Name: Material Science and Metallurgy

Time: 10:30 AM TO 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

			MARKS
Q.1*	**(a)**	Explain the requirement of engineering materials.	**03**
	(b)	Explain zero dimension defects with neat sketch	**04**
	(c)	Draw iron – iron carbide equilibrium diagram. Explain important phases in it. Discuss the phase transformation takes place for the eutectoid steel from liquid to room temperature.	**07**
Q.2	**(a)**	State composition and specific applications of : Muntz metal ; German silver ; Naval brass	**03**
	(b)	What are the effects of alloying chromium, nickel, molybdenum, and carbon in steels?	**04**
	(c)	Justify the need of Heat treatment processes for metals. Explain with neat sketch TTT diagram for heat treatment of steel.	**07**
		OR	
	(c)	Explain magnetic particle testing (MPT) method with neat sketch. Also explain its benefits and limitations.	**07**
Q.3	**(a)**	Write procedure to find miller indices for atomic plane with suitable example.	**03**
	(b)	Explain powder production methods in powder metallurgy manufacturing process with neat sketch	**04**
	(c)	What is critical resolved shear stress? Explain how it is responsible for initiating slip in atomic plane?	**07**
		OR	
Q.3	**(a)**	What is solid solution? Briefly explain types of it with neat sketch.	**03**
	(b)	List types of cast iron. Explain any two types with composition, properties and application.	**04**
	(c)	Draw neat sketch of inverted metallurgical microscope and Explain in detail steps for specimen preparation for metallurgical examination under metallurgical microscope.	**07**
Q.4	**(a)**	Justify the statement “iron shows limited solubility for carbon in solid phase”	**03**
	(b)	List the characteristics required in dye material for dye penetration testing.	**04**
	(c)	List case hardening processes. Explain carburizing and induction hardening with neat sketch.	**07**
		OR	
Q.4	**(a)**	Discuss applications of steels in engineering field.	**03**

	(b)	Explain sintering process in powder metallurgy with neat sketch.	**04**
	(c)	Write short notes on Recovery, Recrystallization and Grain growth	**07**
Q.5	**(a)**	Classify engineering materials and discuss mechanical properties.	**03**
	(b)	With neat sketch explain solidification of metals and alloys.	**04**
	(c)	Draw the phase diagram of binary system showing 100% solubility in liquid and solid phases and explain lever rule.	**07**

OR

Q.5	**(a)**	List applications and properties of tool steel.	**03**
	(b)	Explain white metal and bearing alloys by stating composition, properties and application.	**04**
	(c)	What is atomic packing factor? Derive APF for hexagonal closed pack (HCP) structure with neat sketch.	**07**

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