

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**
