

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-III (NEW) EXAMINATION – SUMMER 2021****Subject Code:3131904****Date:08/09/2021****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.
4. Simple and non-programmable scientific calculators are allowed.

		<b>Marks</b>
<b>Q.1</b>	(a) Classify various types of engineering materials.	<b>03</b>
	(b) What is a solid solution? Explain with a neat sketch various types of solid solutions.	<b>04</b>
	(c) Draw neatly Iron-Iron carbide equilibrium diagram. Name all important phases, temperatures and reactions.	<b>07</b>
<b>Q.2</b>	(a) Define following properties of metals: (a) Hardness, (b) Toughness (c) Fatigue	<b>03</b>
	(b) Explain the importance of microscopic and macroscopic examination of metallic materials.	<b>04</b>
	(c) Define atomic packing factor (APF). Calculate APF for Face centered cubic (FCC) structure with a neat sketch.	<b>07</b>
<b>OR</b>		
	(c) Explain Edge and screw dislocation with the help of a neat figure.	<b>07</b>
<b>Q.3</b>	(a) Briefly explain engineering requirements of materials.	<b>03</b>
	(b) List out the various methods used to combat corrosion.	<b>04</b>
	(c) Define allotropy. Explain it with reference to iron.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) What are the criteria for the selection of engineering materials?	<b>03</b>
	(b) Classify different types of corrosion.	<b>04</b>
	(c) Explain with a neat sketch Time-Temperature-Transformation (TTT) diagram for a eutectoid composition steel.	<b>07</b>
<b>Q.4</b>	(a) List out various applications of powder metallurgy.	<b>03</b>
	(b) Discuss sintering process in powder metallurgy.	<b>04</b>
	(c) Name different types case hardening methods. Explain pack carburizing process with the help of a neat diagram.	<b>07</b>
<b>OR</b>		
<b>Q.4</b>	(a) Explain briefly Full Annealing process.	<b>03</b>
	(b) Explain Austempering process.	<b>04</b>
	(c) Explain with a neat sketch three common methods of powder production and discuss their influence on the properties of the final product.	<b>07</b>
<b>Q.5</b>	(a) State and explain Gibb's Phase Rule.	<b>03</b>
	(b) Explain the 'Lever Rule' with the help of a binary phase diagram.	<b>04</b>
	(c) Describe Ultrasonic Testing Method and also mention its advantages and limitations.	<b>07</b>
<b>OR</b>		
<b>Q.5</b>	(a) Explain the process of solidification in metals.	<b>03</b>
	(b) What is non-equilibrium cooling? Explain.	<b>04</b>
	(c) Explain in detail Radiography testing method along with its advantages, disadvantages.	<b>07</b>

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