

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER– III (New) EXAMINATION – WINTER 2019****Subject Code: 3132004****Date: 3/12/2019****Subject Name: Principles of Materials Science and Metallurgy****Time: 02:30 PM TO 05:00 PM****Total Marks: 70****Instructions:**

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

		<b>MARKS</b>
<b>Q.1</b>	(a) Differentiate material science and metallurgy.	<b>03</b>
	(b) Write a short note on Creep and Fatigue.	<b>04</b>
	(c) Describe material selection process for turbine blade.	<b>07</b>
<b>Q.2</b>	(a) Enlist three non-ferrous metals.	<b>03</b>
	(b) What is APF and CN? State CN for BCC, SC and FCC unit cell system.	<b>04</b>
	(c) What is the significance of crystallographic planes and directions? Enlist the steps to find out crystallographic planes within unit cell.	<b>07</b>
<b>OR</b>		
	(c) Differentiate among single crystal and polycrystalline materials. Also explain isotropy and anisotropy of the materials.	<b>07</b>
<b>Q.3</b>	(a) Explain Bragg's law for crystal structure determination.	<b>03</b>
	(b) Explain jominy hardenability test.	<b>04</b>
	(c) Enlist and explain different point defects in metallic and ionic materials.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Define linear and planer density.	<b>03</b>
	(b) Enlist the steps involved in liquid penetrant test. Explain each briefly.	<b>04</b>
	(c) Give a detailed overview of ultrasonic testing method.	<b>07</b>
<b>Q.4</b>	(a) Explain sintering process in powder metallurgical process.	<b>03</b>
	(b) Give the advantages and disadvantages of MPT.	<b>04</b>
	(c) Explain the ductile and brittle failures with relevant diagram.	<b>07</b>
<b>OR</b>		
<b>Q.4</b>	(a) What is the requirement of performing jominy hardenability test?	<b>03</b>
	(b) Give brief overview of flame hardening process.	<b>04</b>
	(c) Define hardness. Explain Rockwell hardness test in detail.	<b>07</b>
<b>Q.5</b>	(a) State gibb's phase rule giving its significance in metallurgy.	<b>03</b>
	(b) Explain significance of TTT diagram.	<b>04</b>
	(c) Enlist the various techniques for powder production. Explain any one with neat sketch.	<b>07</b>
<b>OR</b>		
<b>Q.5</b>	(a) Enlist the steps involved in micro examination of specimen.	<b>03</b>
	(b) Draw and explain isomorphous binary phase diagram.	<b>04</b>
	(c) Draw iron-iron carbide equilibrium diagram with all necessary details. Briefly explain cooling of 0.8 % carbon steel.	<b>07</b>

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