

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-V (NEW) EXAMINATION – WINTER 2018****Subject Code:2152109****Date:04/12/2018****Subject Name:Advanced Materials****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
<b>Q.1</b>	(a) Explain the role of high Sulfur content in Free Cutting Steel?	<b>03</b>
	(b) Explain the heat treatment cycle for Maraging Steel.	<b>04</b>
	(c) What is Stainless Steel? Which are important properties of Stainless Steel? Compare Ferritic S.S. and Martensitic S.S.	<b>07</b>
<b>Q.2</b>	(a) Explain which properties of Spring Steels are critical?	<b>03</b>
	(b) Give a detailed classification of Tool Steels.	<b>04</b>
	(c) What do you mean by Alloy Cast Iron? Give the composition, properties and applications of High Silicon Cast Iron.	<b>07</b>
	<b>OR</b>	
	(c) Give the composition, properties, applications and heat treatment cycle for Type-1 Ni-hard Cast Iron.	<b>07</b>
<b>Q.3</b>	(a) Give limitations of Magnesium to be used for engineering applications.	<b>03</b>
	(b) Explain the strengthening mechanism behind the high temperature strength of Nickel based Superalloys.	<b>04</b>
	(c) Describe the requirements of aero-space materials. Suggest some candidate materials with their properties.	<b>07</b>
	<b>OR</b>	
<b>Q.3</b>	(a) Write the properties of Cobalt based Superalloys.	<b>03</b>
	(b) Discuss the piston and anvil technique to produce the metallic glasses.	<b>04</b>
	(c) Define amorphous alloys. Compare it with crystalline alloys. Discuss the copper mold casting technique to produce the metallic glasses.	<b>07</b>
<b>Q.4</b>	(a) Write applications of nano materials.	<b>03</b>
	(b) What are the types of Carbon Nanotubes? Explain only with diagrams.	<b>04</b>
	(c) Explain the sol-gel technique for nano-material production with the help of diagram.	<b>07</b>
	<b>OR</b>	
<b>Q.4</b>	(a) Discuss the working of Piezoelectric Materials.	<b>03</b>
	(b) Discuss the characteristics of Titanium that makes it attractive for engineering applications.	<b>04</b>
	(c) Write a note on Magneto- rheological fluid.	<b>07</b>
<b>Q.5</b>	(a) What is Composite? Give a detailed classification of Composites.	<b>03</b>
	(b) Describe the requirements of Cryogenic Materials. Give probable candidate materials that meet the requirements.	<b>04</b>
	(c) Discuss the properties and applications of Superconducting Materials.	<b>07</b>

- Q.5**
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| (a) | Define and explain biocompatibility.   | <b>03</b> |
| (b) | Enlist the properties and applications of Hadfield Steels.   | <b>04</b> |
| (c) | Define bio-functionality. Describe properties and application of Ni-Ti alloy as a useful bio-material. | <b>07</b> |

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