Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – WINTER • 2014

Subject Code: 162104 **Date: 05-12-2014**

Subject Name: Advanced Materials and Applications

Time: 02:30 pm - 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.**

Q.1	**(a)**	Discuss the characteristics of Titanium that makes it attractive for certain engineering applications. Also give its limitations.	**07**
	(b)	Explain the mechanisms by which high strength and creep resistance are achieved in super alloys. Enlist the properties and applications of Co-based super alloys.	**07**
Q.2	**(a)**	What do you mean by alloy cast Iron? Give the composition, properties and applications of High silicon cast iron.	**07**
	(b)	Define composite. Discuss properties & applications of ceramic matrix composites.	**07**
		OR	
	(b)	Describe the requirements of aero-space materials. Enlist some candidate materials.	**07**
Q.3	**(a)**	What is sensitization? Discuss how Inter Granular corrosion is harmful for stainless steel. Suggest the methods to minimize it.	**07**
	(b)	Describe important characteristics & applications of free cutting steel. Give typical composition of a free cutting steel.	**07**
		OR	
Q.3	**(a)**	Mention the properties and applications of Ferritic stainless steel. Give the composition of 409 and 405 stainless steel.	**07**
	(b)	Explain the Heat treatment cycle for Maraging steel. Give properties and applications of maraging steel.	**07**
Q.4	**(a)**	Define Piezoelectricity. Discuss the working of Piezoelectric materials.	**07**
	(b)	What do you mean by body response to foreign materials? Discuss the properties required by biomaterials.	**07**
		OR	
Q.4	**(a)**	Write a note on Electro-rheological fluids.	**07**
	(b)	Describe properties and application of Ni-Ti alloy as an important bio-material.	**07**
Q.5	**(a)**	Explain the sol-gel technique for nano-material production. Draw the necessary diagram. Give advantages of it over other methods.	**07**
	(b)	Define Metallic glasses. Discuss the melt spinning technique to produce the metallic glasses.	**07**
		OR	
Q.5	**(a)**	Explain the mechanism of mechanical alloying technique for nano-powder production. Enlist the process affecting factors.	**07**
	(b)	Discuss the piston and anvil technique to produce the metallic glasses. Write applications of metallic glasses.	**07**

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