GUJARAT TECHNOLOGICAL UNIVERSITY BE - SEMESTER-VI • EXAMINATION – WINTER 2013

Subject Code: 162104

Date: 06-12-2013

Subject Name: Advanced Materials and Applications 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.
- Q.1 (a) What is alloy cast Iron? Write the composition, properties and applications of 07 High silicon cast iron.
 - (b) Discuss important characteristics of Titanium and Magnesium that makes them 07 attractive for certain engineering applications. Also give their limitations.
- Q.2 (a) Explain the mechanism by which high strength and creep resistance are 07 achieved in super alloys. List the properties and applications of Co-based super alloys.
 - (b) What are metallic glasses? Mention their applications. Discuss the melt **07** spinning technique to produce the metallic glasses.

OR

- (b) Compare metallic glasses with crystalline alloys. Discuss the piston and anvil 07 technique to produce the metallic glasses.
- Q.3 (a) What are Nano materials? Explain the mechanical alloying technique for nano- 07 material production. List the process affecting factors.
 - (b) Enlist the properties of Stainless steel. What is sensitization? Discuss how Inter 07 Granular corrosion is harmful for stainless steel. Suggest the methods to minimize it.

OR

- Q.3 (a) Explain the sol-gel technique for nano-material production with necessary 07 diagram. Give the advantages of it over other nano-material production techniques.
 - (b) Discuss important properties and applications of martensitic stainless steel. 07 How hardness and wear resistance is developed in martensitic stainless steels?
- Q.4 (a) Describe important characteristics and applications of free cutting steel. Explain 07 the role of high sulphur content in free cutting steel. Give typical composition of a free cutting steel.
 - (b) Define and explain biocompatibility. Describe properties and application of Co- 07 Cr-Mo alloys as a candidate bio-material.

OR

- Q.4 (a) Explain the structure and properties of TRIP steel. "TRIP steel satisfying the 07 requirements of automotive industry for good formable high strength steel". Justify the statement.
 - (b) Define bio-materials. Enlist the Properties required by biomaterials. Give the **07** classification of bio-materials with application of each.
- Q.5 (a) Define Piezoelectricity. Discuss the working of Piezoelectric materials in detail 07 with example.
 - (b) Define and Classify the composites. Discuss properties and applications of 07 metal matrix composites.

OR

- Q.5 (a) What is Smart Materials? Give their advantages and limitations. Write a note on 07 Magneto- rheological fluid.
 - (b) What do you mean by the aero-space materials? Describe the requirements of 07 aero-space materials. Give example of candidate materials.
