

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 High silicon cast iron. **07**

(b) Discuss important characteristics of Titanium and Magnesium that makes them attractive for certain engineering applications. Also give their limitations. **07**

Q.2 (a) Explain the mechanism by which high strength and creep resistance are achieved in super alloys. List the properties and applications of Co-based super alloys. **07**

(b) What are metallic glasses? Mention their applications. Discuss the melt spinning technique to produce the metallic glasses. **07**

OR

(b) Compare metallic glasses with crystalline alloys. Discuss the piston and anvil technique to produce the metallic glasses. **07**

Q.3 (a) What are Nano materials? Explain the mechanical alloying technique for nano-material production. List the process affecting factors. **07**

(b) Enlist the properties of Stainless steel. What is sensitization? Discuss how Inter Granular corrosion is harmful for stainless steel. Suggest the methods to minimize it. **07**

OR

Q.3 (a) Explain the sol-gel technique for nano-material production with necessary diagram. Give the advantages of it over other nano-material production techniques. **07**

(b) Discuss important properties and applications of martensitic stainless steel. How hardness and wear resistance is developed in martensitic stainless steels? **07**

Q.4 (a) Describe important characteristics and applications of free cutting steel. Explain the role of high sulphur content in free cutting steel. Give typical composition of a free cutting steel. **07**

(b) Define and explain biocompatibility. Describe properties and application of Co-Cr-Mo alloys as a candidate bio-material. **07**

OR

Q.4 (a) Explain the structure and properties of TRIP steel. "TRIP steel satisfying the requirements of automotive industry for good formable high strength steel". Justify the statement. **07**

(b) Define bio-materials. Enlist the Properties required by biomaterials. Give the classification of bio-materials with application of each. **07**

Q.5 (a) Define Piezoelectricity. Discuss the working of Piezoelectric materials in detail with example. **07**

(b) Define and Classify the composites. Discuss properties and applications of metal matrix composites. **07**

OR

Q.5 (a) What is Smart Materials? Give their advantages and limitations. Write a note on Magneto- rheological fluid. **07**

(b) What do you mean by the aero-space materials? Describe the requirements of aero-space materials. Give example of candidate materials. **07**
