

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-III • EXAMINATION – SUMMER 2013****Subject Code: 131904****Date: 04-06-2013****Subject Name: Materials Science & Metallurgy****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) (i) Differentiate metal and non metal and enlist the engineering requirements of material. **04**
(ii) Correlate the property of thermal conductivity and hardness with internal structure of the material. **03**
(b) Establish the co-relationship between number of phase, component and degree of freedom. Also state the significance of this relationship and show that at a eutectic point in a binary phase diagram, degree of freedom is zero. **07**
- Q.2** (a) State different types of corrosion and explain their probable causes of occurrence. Enlist common methods to protect corrosion. **07**
(b) With the aid of an iron-iron carbide equilibrium diagram show and explain eutectic, peritectic and eutectoid transformation. Also mention the significance of these transformations. **07**
- OR**
- (b) Compare cooling curves for pure metal, isomorphous and non-isomorphous alloys. State the information revealed by these cooling curves. **07**
- Q.3** (a) (i) Compare and contrast: micro and macro examination. **03**
(ii) On the basis of colour and pattern of spark, material identity can be established to an extent. Evaluate. **04**
(b) Explain the process steps involved in making of a powder metallurgical product. As regards to powder metallurgy, explain the role of process parameters, positive features and limitations of this method. **07**
- OR**
- Q.3** (a) Compare and contrast ultrasonic testing with radiographic testing as regards to flaw detection capabilities, operational safety, process features and parametric control. **07**
(b) (i) State the properties and applications of monel metal and inconel. **04**
(ii) Draw the microstructure of wrought iron and enlist the properties and uses of wrought iron. **03**
- Q.4** (a) (i) Why is heat treatment needed? Compare annealing and normalizing process as regards to their objectives, applications, process limitations and process merits. **04**
(ii) Differentiate flame hardening and induction hardening process on the basis of parametric control, process features, operational safety and productivity. **03**
(b) Compare and contrast carburizing and nitriding process with reference to parametric controls, process features, process limitations and applications. **07**
- OR**
- Q.4** (a) Compare the hardenability curves obtained from Jominy endquench test for **07**

plain carbon steels with hypoeutectoid and hypereutectoid composition and comment on the hardenability of these two steels.

- (b) Compare malleable cast iron and spheroidal graphite iron on the basis of microstructure, properties and applications. 07

- Q.5** (a) Enlist the properties of pure copper and mention the composition, properties and application of phosphorus bronze. 07

- (b) Differentiate martempering and austempering process on the basis of structure property co-relationship and process application. 07

OR

- Q.5** (a) Enlist the properties of pure aluminum and mention the composition, properties and application of any one aluminum alloy. 07

- (b) Compare and contrast flame hardening and induction hardening on the basis of uniformity of case depth, parametric controls, process features, process limitations and applications. 07
