

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-III • EXAMINATION – WINTER • 2014****Subject Code: 2131904****Date: 01-01-2015****Subject Name: Material Science and 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) 1. State the importance of study of “Material Science” and briefly explain engineering requirement of materials. **03**  
 2. What are slip bands and slip lines? Draw required sketches. What causes the formation of such bands on a metal surface. **04**
- (b) Explain and differentiate Edge dislocation and Screw dislocation with neat sketch. **07**
- Q.2** (a) What is critical nucleus? In case of crystallization of metals, what is the difference between an embryo and a nucleus. What is the significance of critical radius of a solidifying particle? **07**
- (b) Using Gibb’s phase rule, explain unary phase diagram with the help of sketch. **07**
- OR**
- (b) What is cooling curve? Explain and differentiate time temperature cooling curve of an alloy of eutectic composition and pure metal. **07**
- Q.3** (a) Write a short note on: “Iron-iron carbide equilibrium diagram”. **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**
- Q.3** (a) State composition, specific properties and applications of Grey Cast Iron. **07**
- (b) What is phase diagram? Explain Lever rule. **07**
- Q.4** (a) Explain the steps to obtain the TTT-diagram for eutectoid steel and show on it the cooling curve representing annealing and hardening process. **07**
- (b) What are the purpose of Alloying ? Give effects of nickel as an alloying element. **07**
- OR**
- Q.4** (a) Describe and compare Austempering and Martempering. **07**
- (b) Enlist the properties of pure aluminum and mention the composition, properties and application of any one aluminum alloy. **07**
- Q.5** (a) What is Powder Metallurgy? Explain the process of Powder Metallurgy. **07**
- (b) What do you mean by Non-destructive testing? Differentiate destructive and non-destructive testing by stating benefits and limitations. **07**
- OR**
- Q.5** (a) Describe with neat sketch how would you carry out a Jominy harden ability test on a steel sample. **07**
- (b) Give specific applications of powder metallurgy parts also describe merits and de-merits of powder metallurgy process. **07**

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