

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

# GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

**Subject code: 710808 N**

**Subject Name: Material Science and Materials**

**Date: 03 /02 /2011**

**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) Classify Atomic bonding in structure & discuss in detail the bonding in context of bonding forces and energies. **07**
- (b) (i) Derive Pauli's exclusion principle. **04**  
(ii) Give the electron configuration for the followings: **03**  
Magnesium, Aluminum, Iron and copper
- Q.2** (a) (i) Cite the differences between crystalline and non crystalline structure. **04**  
(ii) Explain Anisotropy of material properties. **03**
- (b) Draw and explain Hypothetical energy curve without expansion and actual energy curve with expansion. **07**
- OR**
- (b) Write a short note on "Laser". **07**
- Q.3** (a) Discuss in detail the concept of specific heat in all contexts. **07**
- (b) Explain the Anelastic deformation of materials. **07**
- OR**
- Q.3** (a) Explain in detail the effects of temperature on mechanical properties. **07**
- (b) List the effects of metallurgical variables on Creep. **07**
- Q.4** (a) Derive a theory of Quantized Oscillator model. **07**
- (b) (i) Define the following terms : Hardness & Toughness **04**  
(ii) Explain in brief true stress and strain. **03**
- OR**
- Q.4** (a) Discuss the various requirements of material selection in engineering applications. **07**
- (b) (i) Derive an equation for critical resolved shear stress. **04**  
(ii) Discuss ductile Vs brittle behavior. **03**
- Q.5** (a) Write a short note on Cathodic protection. **07**
- (b) What is the significance of non-destructive testing? Differentiate between X-radiography and Ultrasonic flow detection techniques. **07**
- OR**
- Q.5** (a) Write a short note on Radiation damage and recovery. **07**
- (b) Discuss in detail the effects of temperature on fatigue. **07**

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