

INDIAN MARITIME UNIVERSITY
(A Central University)
B.TECH (MARINE ENGINEERING)
DEC 2014 / JAN 2015 SEMESTER EXAMINATIONS
V SEMESTER
MATERIAL SCIENCE (T 1501)

TIME : 3 Hrs

Max Marks: 100

Date: 4-12-2014

Pass Marks: 50

Part A (3 × 10 = 30 Marks)

Compulsory Questions

1. (a) Define briefly with suitable examples, the principal types of primary bonds holding atoms of materials.
- (b) State the main differences between cast iron and steel
- (c) Give any two applications of PTFE.
- (d) Name five important mechanical tests which give valuable information about metals and alloys.
- (e) Discuss the types of solid solutions that are formed among solids.
- (f) What are the objectives of heat treatment?
- (g) What is a S-N curve? What can we get from the curve?
- (h) How does "Sacrificial Anode" prevent corrosion? Give an example.
- (i) Briefly give the effects of the following elements on steel. Carbon, Sulphur and Phosphorus
- (j) How do you define "Allotropy"? Give a suitable example.

Part B (5 × 14 = 70 Marks)

ANSWER ANY FIVE QUESTIONS FROM THE FOLLOWING

2. Describe the different processes of increasing the surface hardness of a material by changing the composition of surface material. Also, discuss their advantages/ disadvantages. **14 Marks**
3. Show the "Phase Diagram" of an alloy consisting of "A" and "B" when "A" and "B" are soluble in liquid state but completely insoluble in solid state. In this, discuss the formation of "Eutectic Point". **14 Marks**
4. (a) What is "Ultimate Tensile Strength" of a material? **2 Marks**
(b) Describe in detail, the procedure of measuring tensile strength of a material **12 Marks**
5. Write short notes on following :- **14 Marks**
(a) Bronze (b) German Silver (c) High-Speed Steel (d) Stainless Steel
6. (a) What is Creep ? **2 Marks**
(b) Discuss the "Creep Curve" **5 Marks**
(c) What are the factors affecting Creep and how Creep can be minimized by designing **7 Marks**

7. What are crystal imperfections and how do they affect the properties of materials?
Discuss in detail. **14 Marks**
8. What are the various means of arresting corrosion of ferrous material? Discuss each of them briefly.
14 Marks
9. (a) What are the applications of chromium, Titanium in ship board systems . **6 Marks**
(b) What are refractories? Explain their various types and their uses . **8 Marks**