INDIAN MARITIME UNIVERSITY

(A Central University, Government of India)

End Semester Examination December 2017

Programme: B.Tech (Marine Engineering) | **Semester: V**

Subject Name: Material Science | **Subject Code: UG11T2501/1501**

Date: 04.12.2017 | **Maximum Marks: 100**

Time: 3 hours | **Pass Marks: 50**

PART - A **(3 X 10 = 30 Marks)**

(All questions are compulsory)

1. (a) State Pauli's exclusion principle of atomic theory with an example.
   (b) With a neat sketch describe B.C.C. and F.C.C. unit cell.
   (c) Find the APF (Atomic Packing Factor) of a B.C.C. unit cell.
   (d) What is Gibb's phase rule?
   (e) Aluminium alloys are widely used in aeronautics and automotive applications. – Give reasons.
   (f) Draw the stress-strain curves for the following materials: Aluminium and Cast iron .
   (g) Explain the Pilling and Bed Worth rule with suitable example.
   (h) What is Fatigue of metals ?
   (i) What is the function of a "Sacrificial Anode"?
   (j) Write down the effect of following elements on steel : - Manganese , Sulpher and Carbon.

PART – B **(14 X 5 = 70 Marks)**

Answer any five of the following seven questions

2. With a neat sketch describe the Iron – Iron Carbide equilibrium phase diagram according to scale and show different phases on it. 14

3. (a) Differentiate between 'Gray Cast Iron' and 'SGCI' (Nodular cast iron) 7

   (b) Describe Full Annealing process. 7

4. (a) Briefly describe the procedure of carrying out the "Tensile Test" on a sample of material. 7

   (b)Draw the approximate T-T-T diagram for an eutectoid steel. 7

5. (a) Explain the process of failure of material due to fatigue and show what appearance the Fracture Surface may have . 8

   (b) Differentiate between "Stainless steel" and "High speed steel" 6

6 . (a) Explain the basic principle involves in various methods of prevention of corrosion. 8

   (b) What is meant by "substitutional solid solution" and "Interstitial solid solution" ? 6

7. Discuss the name of the best suited material to be selected for the following components with their approximate compositions:

   a) Hull of a ship b) Chain link c) Engine crank shaft d) Diesel engine cylinder cover. 14

8. (a) From the data given below for Bi – C_d system , plot the equilibrium diagram to scale.

Melting temperature of Bi = 271°C

Melting temperature of C_d = 321°C

Eutectic temperature = 144°C 6

Eutectic composition = 39.7% C_d

(b) Write short notes on :

PTFE , Thermoplastics and Thermosetting plastics , Refractory material. 8

***Please supply graph paper along with the question papers.*

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