

Indian Maritime University
(A Central University, Govt of India)
End Semester Examinations- June-July 2019
B.Tech (Marine Engineering)B.Tech(ME)
Semester – V
Material Science (UG11T2501)

Duration: 3 Hrs
Date:10-7-2019

Max Marks: 100
Pass Marks: 50

Part- A
(Compulsory Questions) 10x3=30 Marks

1. (a) Find the Atomic packing factor of a FCC unit cell.
- (b) State the Gibb's Phase rule and explain the terms occurring in it.
- (c) Define the following terms in steel 1) Alpha ferrite 2) Austenite
- (d) Explain the term **tempering of steel**. State its importance.
- (e) Explain the form of corrosion brass suffers in Marine Environment.
- (f) Explain the difference between ductile and brittle fracture.
- (g) Draw and explain the S-N curve of steel.
- (h) State the basic elements of electrochemical cell for corrosion to take place.
- (i) Explain why zinc is used to make sacrificial anode in cathodic protection
- (j) Differentiate between Thermosetting and Thermoplastic polymers

Part B **5x14=70 Marks**
(Answer Any Five Questions of the following)

- 2 (a) Explain how crystal defects are classified? Describe the grain boundary Defect (7)
- (b) Explain how phase diagram of alloy consisting of "A" and "B" having 100% liquid solubility and 100% solid solubility is constructed. (7)
- 3 (a) Draw a typical Engineering stress-strain diagram for mild steel. Explain the following terms 1) Yield strength 2) Ultimate Tensile strength (7)

- (b) Describe the liquid/dye penetrant test for crack detection in marine Components (7)
- 4 (a) Draw the appropriate T-T-T diagram for eutectoid steel and label the various regions (7)
- (b) Write the phase transformation equations for both Eutectic and Eutectoid reactions (7)
- 5 (a) Describe the following heat treatment processes to increase the surface hardness of steel components
1) Carburizing 2) Nitriding (7)
- (b) Describe the various methods to improve the fatigue life of a marine Component (7)
- 6 (a) Differentiate between standard EMF series and Galvanic series of Metals (7)
- (b) Differentiate between Sacrificial Anode method and Impressed current method for Cathodic protection on board ship (7)
- Q7) a) State the effect of carbon on mechanical properties of steel. (3)
Differentiate between Grey cast iron and Spheroidal grey cast Iron (4)
Nodular cast iron)
- b) Discuss the material grades to be selected for the manufacture of the following components with approximate compositions (7)
1) Crank shaft 2) Cylinder head
- Q8) (a) Write short notes on 1) Elastomers 2) PTFE (7)
- (b) Briefly discuss the role of following copper based alloys in marine Applications 1) Brasses 2) Bronzes 3) Cu-Ni alloys (7)
