

Indian Maritime University
(A Central University, Govt of India)

End Semester Examinations – December 2025

Programme Name: B Tech (ME)

Semester: VII

Subject Code: UG11T4705

Subject Name: Marine Materials

Date: 15.12.2025

Max Marks: 70

Duration: 03 Hrs

Pass Marks: 35

General Instructions

- (i) All Sections (A, B & C) are to be attempted.
(ii) Options, if any, are specified in respective section.

Section A

Ten MCQs/Fill in the Blanks of 01 Mark each – Choose the correct answer as applicable.

1. Which type of bonding is most common in metals?
a. Ionic
b. Covalent
c. Metallic
d. Van der Waals
2. A material that lacks long-range order in its atomic arrangement is called:
a. Polycrystalline
b. Single crystal
c. Amorphous
d. Crystalline
3. Thermosetting plastics differ from thermoplastics in that they:
a. Can be remoulded repeatedly
b. Soften on heating
c. Harden permanently after heating
d. Are always transparent
4. The process of joining small molecules to form a long-chain polymer is called:
a. Crystallization
b. Polymerization
c. Vulcanization
d. Amalgamation
5. The iron-carbon equilibrium diagram shows eutectoid transformation at:
a. 727°C
b. 912°C
c. 1130°C
d. 1536°C
6. Primary bonds are formed by
a. Intermolecular forces
b. Interatomic forces
c. Vander wall's forces
d. Dipole interaction between two atoms.

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7. Carburizing involves:
- a. Adding carbon to the surface of steel
 - b. Removing carbon from the core
 - c. Adding nitrogen to surface
 - d. Quenching in oil
8. PTFE (Teflon) is used in marine systems primarily for:
- a. Electrical insulation
 - b. Low friction and chemical resistance
 - c. Structural strength
 - d. Heat absorption
9. Which material is commonly used for ship propellers?
- a. Stainless steel
 - b. Nickel-aluminium bronze
 - c. Titanium
 - d. Carbon steel
10. Carbon fiber reinforced composites are preferred in aircraft and marine structures because they:
- a. Are inexpensive and easy to repair
 - b. Have high strength-to-weight ratio and corrosion resistance
 - c. Have high electrical conductivity and low stiffness
 - d. Absorb water easily

Section B

Five Questions of 02 Marks each

11. Determine the Miller indices of a plane intercepting the X, Y, and Z axes at 1, 2, and 3 units respectively.
12. Explain why fiber-reinforced composites are preferred in marine structures as compared to conventional metals.
13. Define Heat Treatment and state its need in improving material properties.
14. Differentiate between Crystalline and Amorphous solids with suitable examples.
15. Identify non-metallic materials used on board ships and indicate their typical applications.

Section C

Seven Questions of 10 Marks each of which any 05 questions to be answered.

16. a. Classify and describe the various types of crystal defects in solids.
b. Analyse and discuss with sketch the nature and characteristics of Line defects.

(3+7 marks)

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17. a. Explain the polymerization process with suitable examples.
b. Compare and discuss the formation, properties, and applications of the following polymers: PVC, PTFE, Nylon, and PET.
(4+6 marks)
18. a. Illustrate and explain the Iron–Carbon equilibrium phase diagram with a neat sketch.
b. Interpret and highlight the eutectic, eutectoid, and peritectic transformations, specifying their compositions and temperatures.
(5+5 marks)
19. a. Define and explain the purpose and steps involved in the annealing process.
b. Evaluate how different types of annealing affect the mechanical properties of materials.
(4+6 marks)
20. a. Identify and list the factors influencing material selection for marine boilers, piping systems, propellers, and rudders.
b. Examine and justify the distinct characteristics of the materials commonly used for each of these components.
(4+6 marks)
21. Discuss the following surface hardening method used in marine engineering applications along with advantages and disadvantages of surface hardening methods.
a. Nitriding,
b. Carburising
c. Flame hardening
(10 Marks)
22. Write a short note on ceramics? What are different type of Ceramic?
Discuss properties and applications of ceramics in marine sector.
(10 Marks)

