Indian Maritime University

(A Central Univ4ersity, Govt of India)

Supplementary Examinations – March/April 2025

Programme Name: B Tech (Marine Engineering)

Semester: V

Subject Code: UG11T3501

Subject Name: MATERIAL SCIENCE

Date: 29.03.2025	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. If (3 2 6) are the Miller indices of a plane, the intercepts made by the plane on the three crystallographic axes are

   (a) (a, b, c)

   (b) (2a, 3b, c)

   (c) (a, 2b, 3c)

   (d) (2a, b, 3c)

2. Which one of the following is **not correct**

   (a) Martensite has a BCC structure

   (b) Austenite has FCC structure

   (c) The martensite which is formed during quenching is too brittle

   (d) Martensite is a solid solution of carbon in BCC iron

3. Which of the following impurity in cast iron makes it hard and brittle

   (a) Sulphur

   (b) Silicon

(c) Manganese

(d) copper

4. The slow and progressive deformation of a material with time at constant stress is known as _____

(a) Fatigue

(b) Creep

(c) Torsion

(d) Corrosion

5. The local corrosion attack resulting from the formation of small anodes on a metal surface is known as

(a) Fretting corrosion

(b) Stress corrosion

(c) Pitting corrosion

(d) Erosion corrosion

6. Which of the following elements added to iron to improve its oxidation resistance

(a) Magnesium

(b) Chromium and aluminium

(c) Zinc

(d) None of the above

7. Which one of the following is an organic polymer

(a) Aluminium

(b) SiC

(c) PTFE

(d) Wood

8. Which graph shows the fatigue properties?

(a) S-N graph

(b) creep graph

(c) Stress strain graph

(d) Binary graph

9. Which one of the following is **not** an equilibrium heat treatment process

(a) Austenetising

(b) Annealing

(c) Normalizing

(d) Precipitation

10. The atomic bond in NaCl is _____

(a) ionic

(b) metallic

(c) covalent

(d) Vander Waals

Section B

Five Questions of 02 Marks each

11. What is Hume-Rothery rule?
12. State the purpose of normalizing process
13. List down the factors affecting fatigue failure
14. Write a short note on Erosion-Corrosion
15. Name at least three different types of crystal defects

Section C

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

16. a) Calculate the atomic packing factor for FCC and BCC crystal structure. (07 marks)

    b) Explain about crystal imperfection. (03 marks)

17. Draw and discuss CCT diagram for Fe-C system. Draw binary equilibrium diagram for an alloy system exhibiting no solid solubility.

18. a) What is the effect of stress and temperature on a creep curve?

    b) Draw the creep graph for constant load condition.

    (05 marks + 05 marks)

19. Write a short note on crevice corrosion and Intergranular corrosion? Explain the measures to be taken to protect materials from corrosion?

20. a) Write a brief note on different types of stainless steel.

b) What is PTFE? Write down the advantages of using PTFE filled compounds.

(05 marks + 05 marks)

21. Explain the following processes:

(a) Annealing (b) Normalising (c) Martempering

22. a) Write down the composition and specific application of the following materials i) Inconel ii) Muntzmetal and iii) Magnalium

b) Explain of point defect in crystal geometry

(05 marks + 05 marks)