B.Tech. Degree IV Semester Supplementary Examination in Marine Engineering June 2024

MRE 1403 METALLURGY AND MATERIAL SCIENCE
(2013 Scheme)

Time: 3 Hours   Maximum Marks: 100

Answer *ALL* questions   (5 × 20 = 100)

I. (a) Within a cubic unit cell, sketch the following directions.   (15)

    (i) $[1\,0\,1]$ (ii) $[2\,1\,1]$

    (ii) $[1\,0\,\bar{2}]$ (iv) $[3\,\bar{1}\,3]$

    (v) $[\bar{1}\,1\,\bar{1}]$.

(b) Define inter planar spacing.   (5)

OR

II. (a) Distinguish between homogeneous and heterogeneous nucleation.   (10)

(b) Explain in details various types of line defects with neat sketches.   (10)

III. (a) Distinguish between ordered and disordered type solid solutions with   (10)
suitable example and neat sketches.

(b) Explain the phase diagram of isomorphous system with suitable   (10)
examples.

OR

IV. (a) Explain the following reactions with suitable examples.   (10)
    (i) Eutectic reaction
    (ii) Eutectoid reaction.

(b) Draw and explain the Iron – Carbon equilibrium diagram with all   (10)
salient points.

V. Explain any five methods of surface hardening heat treatment processes   (20)
with suitable sketches.

OR

VI. Explain the composition, properties and applications of all categories of   (20)
cast iron.

VII. (a) Explain the mechanism of slip and twinning with suitable sketches.   (10)

(b) Explain the mechanism of creep with suitable sketches.   (10)

OR

VIII. (a) Distinguish between hot working and cold working process with   (10)
suitable examples.

(b) Explain the factors leading to the propagation of crack and also explain   (10)
stress cycle and fatigue failure.

IX. (a) Describe the features of magnetic particle test and radiographic test   (10)
with suitable sketches.

(b) Describe the characteristics of chromium, ceramic, titanium and PTFE   (10)
in ship board systems.

OR

X. (a) Mention the tensile test impact test and with suitable sketch and   (10)
descriptions.

(b) Briefly explain the selection of materials in ship building and marine   (10)
engineering.

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