Exam Date & Time: 20-Jan-2023 (09:30 AM - 12:30 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

THIRD SEMESTER B.TECH MAKEUP EXAMINATIONS, JAN 2023

MATERIAL SCIENCE AND METALLURGY [MME 2153]

Marks: 50 **Duration: 180 mins.**

A

Answer all the questions.

Instructions to Candidates: Answer ALL questions Missing data may be suitably assumed

1) With standard notations, determine the packing factor of BCC unit cell. (4)

A)

B) With an example, explain the procedure to determine the miller indices for crystallographic direction. (4)

C) Represent the following Miller Indices.

i) [111] ii) (001). (2)

2) Melting temperatures of pure metals ‘A’ & ‘B’ are 1100°C and 900°C respectively. The metals ‘A’ and ‘B’ are mutually soluble in the liquid state and completely insoluble in the solid state. A liquid phase alloy containing 40% A completely transforms into a

A) mixture of two solid solutions at 700°C. Assuming the curves to be linear, draw phase diagram to scale and label the regions. For 30% B alloy determine the following: (5)

i)Weight percentage of eutectic formed at 700°C.

ii) The amount of liquid present and its composition, at a temperature of 750°C.

B) With a required sketch, explain the concept of undercooling. (3)

C) Write a short note on Edge Dislocation. (2)

3) Draw the neat sketch of the Iron-Iron Carbide phase diagram and label all the salient points, lines and regions on it. (5)

A)

B) Illustrate with example, the application of Gibb’s phase rule in unary systems. (3)

C) Differentiate between homogeneous and heterogeneous solidification processes. (2)

4) Write short notes on: (i) Cast iron (ii) Brass. (4)

A)

B) Briefly explain about High Speed Steel. (3)

C) Mention the properties and applications of Magnesium Matrix composites. (3)

5) Explain the formation of dendritic structure in spontaneous solidification process. (4)

A)

B) Briefly explain about the classification of composite materials based on the reinforcement. (3)

C) With a neat sketch, explain the stir casting process. (3)

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