INTERNATIONAL CENTRE FOR APPLIED SCIENCES (MAHE)

III SEMESTER B.Sc.(Applied Sciences) DEGREE EXAMINATION – NOV 2021

DATE: 24 NOV 2021

SUBJECT: MATERIAL SCIENCE AND METALLURGY (IME 233) (BRANCH: MECHANICAL)

✓ Answer ANY FIVE full Questions.

- ✓ Missing data, if any, may be suitably assumed
- 1A Draw the neat sketch of FCC cubic unit cell and find i) lattice parameter in terms of atomic radius ii) co-ordination number iii) effective number of atoms per unit cell
- 1B Compare edge and screw dislocations with the help of neat sketches along with their Burger's circuit.
- 1C Show the following planes and directions in cubic systems: $(\overline{200})_{*}$
- 2A What are solid solutions? Explain different types of solid solutions with necessary sketches.
- 2B Explain the mechanism of solidification of liquid metals.
- 2C How solidification of an alloy is different from pure metal?
- 3A Discuss the application of the lever rule in a phase diagram.
- 3B Write a short note on intermetallic and interstitial compounds with examples.
- 3C Explain construction method of Isomorphous phase diagram

(2+3+4=10 Marks)

4A Melting temperatures of Copper (Cu) and Silver (Ag) are 1080^oC and 960^oC respectively. The metals Copper and Silver are mutually soluble in the liquid state and partly soluble in the solid state. A liquid phase alloy containing 70% Silver completely transforms into a mixture of two solid solutions at 780^oC. The maximum solubility of Ag in Cu and Cu in Ag are 8% and 10% respectively at 780^oC. The room temperature solubility is negligible. Assuming the curves to be linear, draw a phase diagram to scale and label the regions. For 40% Ag alloy, determine the following:

i)Composition of the nucleus. ii)Composition of the last drop of the liquid precipitating iii) Weight percentage of eutectic formed at 780^oC. iv)Weight ratio of the solid phases in the eutectic mixture v) Composition of the liquid phase undergoing eutectic reaction

4B Draw an Iron -Carbon phase diagram and label the regions. Write the invariant reactions involved in it. Also draw the cooling diagram of pure iron.

(5+5 Marks)

- 5A Write the construction procedure of the TTT diagram for 0.8% carbon steel and superimpose the cooling curves to obtain martensitic and bainitic structure.
- 5B Write composition, properties and applications of various plain carbon steels
- 5C Distinguish between, i) Annealing and Normalising ii) Hardness and Hardenability

(5+3+2 Marks)

(3+5+2=10 Marks)



Time: 3 Hours

(200), (100), [210], [121]

(3+5+2=10 Marks)

Max. Marks: 50