

INTERNATIONAL CENTRE FOR APPLIED SCIENCES MAHE, MANIPAL B.Sc. (Applied Sciences) in Engg. End – Semester Theory Examinations – Nov./ Dec. 2020 III SEMESTER - MATERIAL SCIENCE AND METALLURGY (IME 233) (Branch: Mechanical)

Гіme: 3 Hours	Date: 25 November 2020	Max. Marks: 50
✓ Answer ALL the	e questions.	
✓ Missing data, if a	anv. mav be suitably assumed	

- 1A What is atomic packing factor? Show that free space in FCC unit cell is 26%.
- **1B** Explain the procedure of obtaining miller indices for planes and sketch the following planes of miller indices: (201), (212), (100) (311)
- **1C** Write short note on: i)Screw dislocation ii) Frankel and Schottky Defects

(4+3+3=10 Marks)

2A Differentiate the following with necessary diagrams

i)Homogeneous and heterogeneous nucleation

ii)Cooling curves for single and multi-component systems

- **2B** What is the importance of super cooling in solidification of liquid metals?
- **2C** What are the different types of solid solutions?

(4+3+3=10 Marks)

- **3A** Two metals A & B are used to form an alloy containing 75% A and 25% B. A melts at 650^oC and B at 450^oC. When alloyed together, A & B do not form any compound or intermediate phases. The solid solubilities of metal A in B and B in A are negligible. The metal pair forms an eutectic at 40% A which solidifies at 300^oC. Assuming straight liquidus and solidus lines, draw the phase diagram for the alloy series and find: a. Weight % of eutectic in the alloy at room temperature. b. The ratio of two solids in the eutectic mixture. c. Temperature when there is equal proportions of solid and liquid phases exists.
- **3B** What do you mean by intermediate phase? Explain any two of them.

(5+5=10 Marks)

- **4A** Explain the construction procedure of binary Isomorphous system. Give an example and sketch the diagram.
- **4B** Neatly sketch the Fe-Fe₃C phase diagram and label the regions and show cooling diagram of pure iron

(5+5=10 Marks)

- **5A** With relevant sketches explain the construction of TTT diagram for 1080 steel .Show possible heat treatment processes in it.
- **5B** Explain the theory of case hardening treatment. Also, explain carburizing and nitriding processes with chemical reactions

(5+5=10Marks)
