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INTERNATIONAL CENTRE FOR APPLIED SCIENCES (MAHE) III SEMESTER B.Sc. (Applied Sciences) MAKE -UP EXAMINATION – January 2022

SUBJECT: MATERIAL SCIENCE AND METALLURGY (IME 233)

(BRANCH: MECHANICAL)

Time:	3	Hours
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Date: 11th January 2022

Max. Marks: 50

- ✓ Answer ANY FIVE full Questions
- ✓ Missing data, if any, may be suitably assumed
- 1A. Draw the neat sketch of HCP structure and, find co-ordination number and the atomic packing factor.
- 1B. How do you obtain miller indices for planes? Obtain miller indices for following planes.



1C. Write the differences: i)Edge and Screw dislocation ii) Schottky and Frankel defects

(4+3+3 = 10 marks)

- 2A. What is nucleation? Explain homogeneous and heterogeneous nucleation highlighting differences
- 2B. What is the importance of super cooling in solidification.
- 2C. Write short notes on: i)Intermetallic compounds ii) Gibb's phase rule .

(4+3+3=10 marks)

- 3A. Explain the construction procedure of binary Isomorphous system. Explain the application of lever rule in it.
- 3B. Write short note on: Congruent melting alloy, Eutectic and Eutectoid systems, Non equilibrium cooling (5+5=10 Marks)
- 4A. An alloy pair A and B forms a eutectic at 600°C for composition 40% B. A and B have unlimited mutual liquid solubility. Two metals A and B have their melting points at 1000°C and 900°C respectively. Their solid solubilities are as follows: 5% B in A at 600°C and 5% B in A at 0°C ,4% A in B at 600°C and 4% A in B at 0°C Assume the liquidus, solidus and solvus lines to be straight. No solid state reactions or any intermediate phase changes occur in the series. i)Draw the phase diagram for the series and label all salient temperatures, composition 30%A with respect to the number, type, amount and composition of the phases iii) Amount of eutectic and pro eutectic phases for 30%A alloy at room temperature iv) Temperature where equal proportions of liquid and solid phases exists for 30%A alloy.
- 4B. Neatly sketch the Fe-C phase and label the regions. Write room temperature microstructure and calculate eutectoid and pro eutectoid phases for 0.5% C steel.

(5+5=10 Marks)

- 5A. Draw IT diagram for 1080 steel. Show cooling curves of possible heat treatments on IT diagram.
- 5B. List the various types of cast irons and explain their characteristics.
- 5C. Write heating temperature range required and final microstructure obtained for following heat treatments: i) Annealing ii) Normalizing iii) Hardening iv) High temperature tempering

(3+3+4=10 Marks)