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**MANIPAL INSTITUTE OF TECHNOLOGY**  
(A constituent college of Manipal University, Manipal)



**III SEM. B.E. (MECHANICAL ENGG.& I.P.ENGG.) DEGREE END SEMESTER  
(MAKE-UP) EXAMINATION JAN. 2007**

**SUBJECT : MATERIAL SCIENCE AND METALLURGY ( MEE-207/IPE-207 )  
REVISED CREDIT SYSTEM  
( 13/01/2007 )**

Time: 3 Hours.

MAX.MARKS: 50

**Instructions to Candidates:**

- ❖ Answer **ANY FIVE FULL** questions.
- ❖ Use graph sheets if required.
- ❖ Missing data may be suitably assumed.

- 1A) Sketch and explain the binary phase diagram of an alloy system which forms mechanical mixture of two pure metals on cooling. Assume there is no solid to solid state transformation. With the help of cooling curve explain the solidification behaviour of isothermally solidifying alloy. Name the system. (06)
- 1B) Find the effective number of atoms in BCC & HCP structures. (04)
- 2A) Explain the construction procedure of isothermal transformation diagram for eutectoid steel and sketch the diagram. (06)
- 2B) Write short notes on –  
i) Brass ii) Free cutting steel. (04)
- 3A) In Cu-Ni binary isomorphous system the following details about the alloy are known at 1200°C.
- i) Composition of the liquid phase 70% Cu (by weight)
  - ii) Composition of solid phase = 80% Ni (by weight)
  - iii) Amount of solid solution formed = 120 gms.
  - iv) Alloy weight = 200 gms.
- Determine the composition of the alloy. (04)
- 3B) Sketch neatly Fe-Carbon equilibrium diagram & label different phases. With cooling curve explain the formation of LEDEBURITE. (06)
- 4A) Write the general purpose of heat treatment. With heat treatment cycle explain the following:  
i) Hardening ii) Carbonitriding. (06)

- 4B) Write the composition, property & uses of-  
i) Stainless steel ii) White cast iron. (04)
- 5A) With sketches explain edge and screw dislocations. (06)
- 5B) Differentiate between hardness & hardenability. Also name and explain the factors which affect the hardness of the steel. (04)
- 6) Write short notes on –  
i) Induction hardening  
ii) Nitriding  
iii) Interstitial compound  
iv) Miller indices.  
v) Conditions to form interstitial solid solution. (10)

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