

BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI  
(END SEMESTER EXAMINATION)

CLASS: B.TECH.  
BRANCH: CIVIL/ECE

SEMESTER : IV  
SESSION : SP/2023

SUBJECT: PE227 ENGINEERING MATERIALS

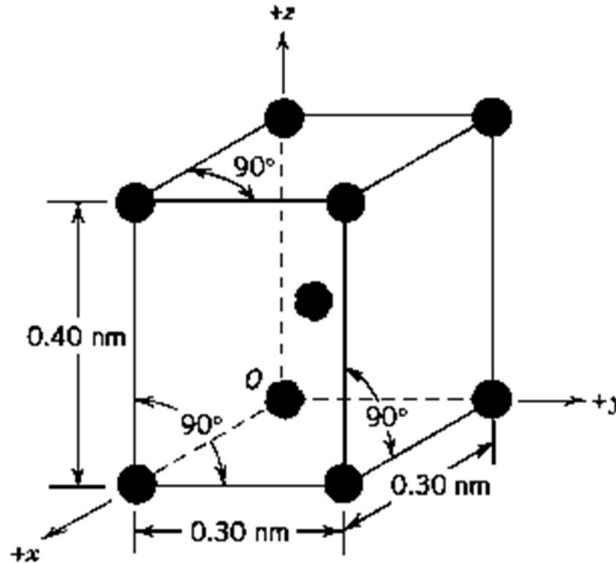
TIME: 3 Hours

FULL MARKS: 50

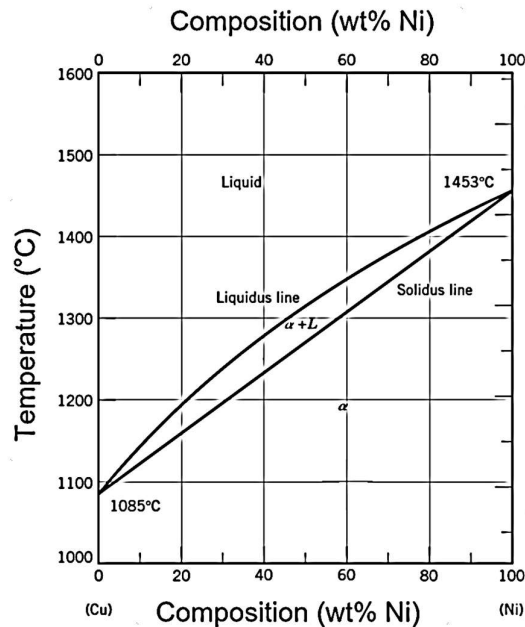
**INSTRUCTIONS:**

1. The question paper contains 5 questions each of 10 marks and total 50 marks.
  2. Attempt all questions.
  3. The missing data, if any, may be assumed suitably.
  4. Before attempting the question paper, be sure that you have got the correct question paper.
  5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.
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|---|----|----|
| Q.1(a) Illustrate the unit cells of the 7 primitive crystal systems in terms of the lattice parameters (edge lengths and interaxial angles) with neat sketches. [5] | 1  | 2  |
| Q.1(b) I. Differentiate between edge and screw dislocation. [3+2]   | 2  | 3  |
| II. The accompanying figure shows a unit cell for a hypothetical metal. To which crystal system does this unit cell belong? Identify this crystal structure.        |    |    |



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|--|-----|---|---|
| Q.2(a) A copper-nickel alloy of composition 70 wt% Ni-30 wt% Cu is slowly heated from a temperature of 1300°C. | [5] | 2 | 4 |
| 1. At what temperature does the first liquid phase form?   |     |   |   |
| 2. What is the composition of this liquid phase?   |     |   |   |
| 3. At what temperature does complete melting of the alloy occur?   |     |   |   |
| 4. What is the composition of the last solid remaining prior to complete melting?                              |     |   |   |



- Q.2(b) I. List some applications of (i) titanium alloys and (ii) copper alloys. [2] 2 2  
 II. List the limitations of Fe-C equilibrium phase diagram. [1]  
 III. Differentiate between time-temperature-transformation diagram and continuous cooling transformation diagram of eutectoid steel. [2]
- Q.3(a) I. Show the crystal structure of layered silicates. [2+3] 3 3  
 II. State the properties, applications and examples of super conducting ceramic materials.
- Q.3(b) What are the different forming methods of glass products? Describe any one of them with suitable diagram. [5] 3 2
- Q.4(a) Compare thermoplastic, thermosetting polymer and elastomer based on their properties. Show various kinds of defects in polymer crystallite with neat sketch. [2+3] 4 3  
 Q.4(b) Discuss various types of reinforcement in ceramic materials [5] 4 2
- Q.5(a) What are the factors which determine the fatigue and creep in materials? Describe 'piezoelectricity'. State its significance with application. [2+3] 5 2  
 Q.5(b) Define Hardness of a material. How can the hardness of a material be measured? [5] 5 1

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