Code No: RR220805 **Set No.1**

II B.Tech. II Semester Regular Examinations, April/May -2005
MATERIAL SCIENCE FOR CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Sketch the five, two dimensional (plane) lattices.
   (b) Explain why each is a distinct distribution of points in two dimension.
   (c) Why is "entered square" not a separate plane lattice.
2. Give detailed explanation for powder method.
3. Sketch the distortion of the structure around an edge dislocation and show the preferred regions for large substitutional atoms and interstitial atoms.
4. Derive an expression for energy per unit area of the grain boundary in polycrystalline solids? Discuss on grain boundary.
5. Explain the differences between :
   (a) Elastic limit and proportional limit
   (b) Yield point and yield strength
   (c) Toughness and resilience
   (d) Endurance limit and fatigue strength
6. Cite five engineering applications where metal is cold-worked to increase the tensile strength?
7. (a) Write about Griffith theory of fracture?
   (b) Why is the fracture strength of real materials lower than the ideal breaking strength?
8. Diffusion of carbon at the austenite-pearlite interface can occur by three alternative paths. Sketch them and estimate which one should be preferred. The diffusion coefficient of carbon in ferrite is about (10^2) larger than austenite.

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Code No: RR220805 **Set No.2**

II B.Tech. II Semester Regular Examinations, April/May -2005
MATERIAL SCIENCE FOR CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain how crystal planes are designated. What are Miller indices. Explain them with reference to the planes of a cube.
2. The Brag angle corresponding to reflection for which $(h^2+k^2+l^2)=8$ is found be 14.35^0 . Determine the lattice parameter of the crystal. X-rays of wave length $0.71A^0$ are used. If there are two other reflections with smaller Brag angles, what is the crystal structure?
3. (a) What is meant by inter metallic compound? And interstitial compound?
   (b) State the similarities and differences if any between them.
4. Discuss :
   (a) How solute atoms affect dislocation motion?
   (b) How precipitate particles affect dislocation motion?
5. Compare and contrast elastic and plastic materials in terms of their behavior under a tensile load?
6. What is understood by viscoelastic deformation? State the mechanical models to demonstrate viscoelastic behavior of materials? Name the materials which exhibit viscoelastic behavior?
7. How fractures are classified? State and explain different types of fracture giving appearance of the fracture in each case?
8. Define grain boundary and account for its character.

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Code No: RR220805 **Set No.3**

II B.Tech. II Semester Regular Examinations, April/May -2005
MATERIAL SCIENCE FOR CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Sketch the five, two dimensional (plane) lattices.
   (b) Explain why each is a distinct distribution of points in two dimension.
   (c) Why is "entered square" not a separate plane lattice.
2. Given that lattice parameter of Ni (F.C.C.) is a =0.3524nm. Calculate the values of θ corresponding to the first six diffraction peaks for the X-ray wavelength used λ =0.145nm.
3. (a) What is a solid solution?
   (b) Discuss the similarities and differences between substitutional and interstitial solid solution.
4. To provide some perspective on the dimensions of atomic defects, consider a metal specimen that has a dislocation density of 104 mm^{-2}. Suppose that all the dislocations in 1000 mm^3 were somehow removed and linked end to end. How far would this chain extend? Now suppose that the density is increased to 1010mm^{-2} by cold working, what would be the chain length of dislocations in 1000 mm^3 of material?
5. Define : Poisson's ratio? What they indicate in material properties?
   (a) Modulus of elasticity and
   (b) Poisson's ratio? What they indicate in material properties?
6. Cite five engineering applications where metal is cold-worked to increase the tensile strength?
7. What are the factors affecting creep and explain the mechanism of creep?
8. (a) What is meant by crystal points and critical range?
   (b) How they are related to heating and cooling?
   (c) What practical significance do they have.

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Code No: RR220805 **Set No.4**

II B.Tech. II Semester Regular Examinations, April/May -2005
MATERIAL SCIENCE FOR CHEMICAL ENGINEERING
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain why covalent bond is directional and the metallic and ionic bonds are non-directional.
2. Sodium and chlorine weigh 22.997 and 35.457gm/atomic weight respectively. If the density is 2.165 gm/cm^3. Calculate the dimensions of unit cell of Nacl.
3. What is meant by crystal imperfections? Classify them in order of their geometry.
4. At any instant of time, the grain growth i.e the rate of increase of the grain radius with time, dr/dt, is proportional to the grain boundary energy stored per unit volume of the material. Show that the radius of spherical grains increases as the square root of time?
5. Explain the differences between:
   (a) Hardness and brittleness
   (b) Strength and stiffness
   (c) Ductility and malleability
   (d) Elasticity and plasticity
6. What is understood by viscoelastic deformation? State the mechanical models to demonstrate viscoelastic behavior of materials? Name the materials which exhibit viscoelastic behavior?
7. How fractures are classified? State and explain different types of fracture giving appearance of the fracture in each case?
8. Give the examples of the polymorphic (allotropic) transformations in iron and discuss their importance in practical applications.

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