(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 0428 Roll No. | | | | | | | | | | |

B.Tech.

(SEMESTER-III) THEORY EXAMINATION, 2012-13

MATERIALS SCIENCE IN ENGINEERING

Time : 3 Hours] *[Total Marks : 100*

Note : Attempt **all** Sections.

Section – A

1. Attempt **all** questions : 10 × 2

(a) Write Peritectic and peritectoid reaction in a phase diagram.

(b) Differentiate between annealing and tempering.

(c) Define superconductivity.

(d) Classify solids on the basis of energy gaps. Briefly discuss any one.

(e) Write the eutectic and eutectoid reactions.

(f) What is lever rule ?

(g) Which material is used for transformer core; and why ?

(h) Define the term hardness and hardenability.

(i) Draw the direction [$\bar{1}\,\bar{1}\,\bar{1}$] in a cubic unit cell and plane ($\bar{1}\,\bar{1}\,\bar{1}$)

(j) What is refractory material; give one example, main property and application ?

Section – B

2. Attempt any **three** parts : 3 × 10

(a) (i) Classify the engineering materials. Briefly discuss with suitable examples. Also discuss composites.

(ii) Obtain the Miller Indices of the plane whose intercepts are; a, b/2 and 3c on *x*, y and z axis respectively in a simple cubic unit cell.

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(b) (i) What are the various experimental methods used in X-ray diffraction to study the crystal structure ? Discuss any one.

(ii) Calculate the atomic density (number of atoms per unit area) of (111) and (110) and (100) planes of Cu (FCC crystal) with the lattice parameter 3.61 Å.

(c) (i) Calculate the atomic packing factor for the unit cell of BCC and FCC space lattices.

(ii) Discuss and draw a eutectic Binary phase diagram with a suitable example. Discuss the phase rule in various regions.

(d) (i) Explain the term corrosion. How materials can be protected against corrosion ?

(ii) Explain the principle of ferromagnetism with a diagram. What is hysteresis loss ?

(e) What are the most used Cu alloys ? Discuss the type, application and properties of bronze.

Section – C

Attempt **all** questions. **5 × 10**

3. What are the defects and imperfections in a crystal ? Describe them with neat sketches.

OR

(i) What is non destructive testing (NDT) ? Explain any one method for surface crack determination.

(ii) Write a note on ultra sonic flaw detection or eddy current method for flaw detection.

4. (i) The Dimension of nickel unit cell is being determined by calculating d_{200} using the X-rays of wavelength 0.58 Å. If the reflection angle is 9.5°, what is the size of unit cell ?

(ii) Compare the working and construction of blast furnace and cupola furnace.

5. Explain the mechanical behaviour of plastic. Discuss their properties and application.

OR

Enumerate various method of ceramic processing. Discuss their salient feature in detail. Explain any two processing in detail.

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6. Draw the TTT diagram for eutectoid steel, what is the importance of TTT diagram. Discuss the formation of 50% Bainite + 50 % Pearlite and 100% Martensite from the eutectoid composition.

7. Attempt any **two** parts :

(i) Define endurance limit. How to find out the endurance limit of any material ?

(ii) What are the typical alloys of Al ? Write their applications.

(iii) What do you understand by Solid Solutions ? Classify them, discuss with neat sketch. What is Hume Rothery's rule ?

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