Model Question Paper (CBCS) with effect from 2015-16

USN | | | | | | | | | | | 15ME32

Third Semester B.E. Degree (CBCS) Examination, Dec.2016/Jan.2017

Material Science & Metallurgy

Time: 3 hrs. Max. Marks: 80

Answer any FIVE full questions, choosing one full question from each module.

Module 1

1) A) Define atomic packing factor. Sketch the unit cell of a FCC & HCP crystal structure. Derive an expression for the density of atomic packing to FCC & HCP structure. (12 Marks)

B) The unit cell of chromium is cubic and contains 2 atoms. Determine the dimension of the chromium unit cell when atomic weight (C_v) = 52 and density of chromium (ρ) =7.19mgm^{-3}. (4 Marks)

OR

2) A) Sketch & explain different stages of creep. Which stage of creep is considered during designing a product? (8 Marks)

B) What do you mean by imperfection in crystals? Explain briefly the different types of crystal imperfections. (8 Marks)

Module 2

3) A) Mention the types of solid solutions. Enumerate Hume-Rothary rules governing the formation of solid solution. (8 Marks)

B) State & explain Gibbs phase rule. (4 Marks)

C) Explain the factors governing the formation of substitutional solid solutions. (4 Marks)

OR

4) A) Draw the Iron-carbon equilibrium diagram and label it. Show the invariant reactions. (8 Marks)

B) List & Discuss different types of stainless steels. (4 Marks)

C) Explain the effect of common alloying elements on steel. (4 Marks)

Module 3

5) A) What is Hardenability? Explain with neat sketch jominy-end quench test. (8 Marks)

B) Explain the steps to construct TTT diagram. Draw a labeled sketch of TTT diagram for an eutectoid steel. (8 Marks)

OR

6) A) Define surface hardening process. With the help of neat sketch explain different types of carburizing process. (8 Marks)

B) Sketch and explain any two types of cast iron, with microstructure, composition and properties. (8 Marks)

Module 4

7) A) Sketch & explain different methods of processing ceramics. (8 Marks)

B) Distinguish between the properties of ceramics, metals and plastics. (8 Marks)

OR

8) A) With a neat sketch explain any two methods of processing plastics. (8 Marks)

B) What are shape memory alloys? List the applications of shape memory alloys. Discuss the term "shape memory effect". (8 Marks)

Module 5

9) A) Define composite material. Give the classification based on matrix and reinforcement. (8 Marks)

B) Sketch and explain Pultrusion process and filament winding process and mention the applications. (8 Marks)

OR

10) A) Sketch and explain Hand layup and spray layup process. Discuss their advantages and limitations. (8 Marks)

B) Derive the rule of mixtures for the modulus of elasticity of a fiber reinforced composite, when a stress is applied along the axis of the fiber. (8 Marks)