CBCS Scheme

USN | | | | | | | | | | |

15MR32

Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
Material Science and Metallurgy

Time: 3 hrs. Max. Marks: 80

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

Module-1

1 a. Define atomic packing factor. Calculate atomic packing factor for BCC and FCC unit cell. **(07 Marks)**

b. Classify crystal imperfections. Explain line imperfections. **(09 Marks)**

OR

2 a. Draw the stress-strain diagram of mild steel. Explain the following:
i) Offset yield strength
ii) Toughness
iii) Ultimate tensile strength
iv) Fracture strength. **(08 Marks)**

b. State Fick's laws of diffusion. Explain factor affecting diffusion coefficient. **(08 Marks)**

Module-2

3 a. Differentiate between slip and twinning. **(08 Marks)**

b. Explain with neat sketch cup and cone fracture. **(08 Marks)**

OR

4 a. Define creep and explain the creep curve. **(08 Marks)**

b. Explain fatigue test and plot S-N curve for mild steel and aluminium alloy. **(08 Marks)**

Module-3

5 a. What is solidification? Derive an expression for critical radius of nucleus. **(08 Marks)**

b. Define solid solution. Explain the Hume-Rothery rule for the formation of solid solution. **(08 Marks)**

OR

6 a. Explain briefly the construction of phase diagram using cooling curve with a neat sketch. **(08 Marks)**

b. Name the different types of phase diagram. Draw a binary eutectic phase diagram between two components which are partially soluble in solid state. Label all the phases. **(08 Marks)**

Module-4

7 a. Draw Iron-Carban equilibrium diagram and label all the phases. Give the three invariant reactions. **(08 Marks)**

b. Draw the TTT diagram for an eutectoid steel and explain various transformation product of austenite on cooling. **(08 Marks)**

OR

8 a. Explain the following heat treatment processes:
   i) Normalizing
   ii) Mar tempering
   iii) Cyaniding
   iv) Flame hardening. **(10 Marks)**

   b. Discuss the solidification sequence of a hypo eutectoid steel 0.4% carbon as it cooled from liquid state to room temperature. **(06 Marks)**

Module-5

9 a. Explain properties, composition and uses of following:
   i) Grey cast iron
   ii) S. G. iron
   iii) Alloys of copper (any two). **(09 Marks)**

   b. Define a composite. Mention any four advantages and application of composite materials. **(07 Marks)**

OR

10 a. With neat sketch explain the fabrication of fibre reinforce plastic by hand lay-up process. **(08 Marks)**

   b. Write note on following:
   i) Aluminimum alloy (any two)
   ii) Titanium alloy. **(08 Marks)**

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