CBCS SCHEME

USN | | | | | | | | | |

15AU32

Third Semester B.E. Degree Examination, June/July 2019

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. What are imperfections? Explain how imperfections are helpful in engineering materials? And classify the types of imperfections in solids. **(08 Marks)**

b. State and explain the Fick's I and II laws of diffusions. **(08 Marks)**

OR

2 a. With the help of a neat sketch conventional stress-strain diagram for mild steel under uniaxial tension, explain clearly the behavior of the material till fracture. **(08 Marks)**

b. Sketch the unit cell of HCP lattice. Estimate the effective number of atoms per unit cell in HCP. **(04 Marks)**

c. Determine the atomic packing factor of FCC Unit Cell. **(04 Marks)**

Module-2

3 a. List out the differentiate between the Ductile and Brittle fracture. **(08 Marks)**

b. Draw a typical three stage creep curve and explain clearly the phenomenon and mechanism in each stage. **(08 Marks)**

OR

4 a. What is fatigue? Explain in brief fatigue testing and plot S-N curve for mild steel and aluminium alloy. **(08 Marks)**

b. State the factors that affects the fatigue strength of metal. **(04 Marks)**

c. Discuss the factors affecting creep. **(04 Marks)**

Module-3

5 a. Explain Heterogeneous Nucleation and find the expression for interfacial surface tension between the particles. **(08 Marks)**

b. Explain crystal growth and nucleation with a neat sketch. **(04 Marks)**

c. Draw the structure of a typical cast ingot and identify various regions. **(04 Marks)**

OR

6 a. Explain briefly the Hume-Rothery rules of substitutional solid solution. **(08 Marks)**

b. Give the expressions for the following invariant reactions with sketches: Eutectic, Eutectoid, Peritectic and Paritectoid **(08 Marks)**

Module-4

7 a. Draw TTT diagram for eutectoid steel 0.83% C and explain briefly different microstructure. **(10 Marks)**

b. Differentiate between Austempering and Martempering. **(06 Marks)**

OR

8 a. Compare SG, Grey CI, with respect to composition Microstructure, properties and applications. **(08 Marks)**

b. Write a short note on Brasses, Copper and its alloys. **(08 Marks)**

Module-5

9 a. Define a composite. What is the role of matrix in composite materials? **(06 Marks)**

b. Explain with a neat sketch Hand layup process. **(06 Marks)**

c. List the advantages and applications of composites. **(04 Marks)**

OR

10 a. Define a shape memory alloys. Mentions the different phases of a shape memory alloys and mentions its important applications areas in different fields. **(10 Marks)**

b. Explain the working of optical fiber. **(06 Marks)**

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