CBCS SCHEME

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

18MR32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
Material Science

Time: 3 hrs. Max. Marks: 100

Note: ***Answer FIVE full questions, choosing ONE full question from each module.***

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Define atomic packing factor. Determine the atomic packing factor of FCC unit cell. **(10 Marks)**

b. Classify crystal imperfections in crystals. Explain in detail line imperfections. **(10 Marks)**

OR

2 a. Draw stress strain curve for mild steel and explain all the points in that. **(10 Marks)**

b. Explain with sketch the ductile to brittle transition in materials. **(05 Marks)**

c. Define :
(i) Elastic strength (ii) Stiffness (iii) Resilience
(iv) Toughness (v) Ductility. **(05 Marks)**

Module-2

3 a. With a neat sketch, explain slip and twining deformation in materials. **(10 Marks)**

b. With a neat sketch, explain ductile fracture, stages. **(10 Marks)**

OR

4 a. Draw S-N curve for steel and aluminium. **(05 Marks)**

b. Discuss the factors affecting fatigue strength in metals. **(05 Marks)**

c. Define creep and the effects of, (i) Stress (ii) Temperature on creep curve. **(10 Marks)**

Module-3

5 a. Explain the solidification of pure metals. **(05 Marks)**

b. Explain with neat sketch the grain structure of cast metals. **(05 Marks)**

c. What is a solid solution? Explain Hume-Rothery rules for solid solution. **(10 Marks)**

OR

6 a. Describe the construction of phase diagrams by thermal analysis. **(10 Marks)**

b. State Gibbs phase rule and explain each terms. **(05 Marks)**

c. Explain with sketches (i) Eulectic reaction (ii) Peritectoid reaction. **(05 Marks)**

Module-4

7 a. Draw Fe-C equilibrium diagram and label all the fields, also explain all the invariant reactions in the system. **(10 Marks)**

b. Define: (i) Austenite (ii) Ferrite (iii) Cementite (iv) Martensite
(v) Pearlite **(05 Marks)**

c. Explain the microstructure of steel at 0.83 and 1.2% C. **(05 Marks)**

OR

8 a. What is TTT diagram? Draw TTT diagram for an eutectoid steel and explain the various transformation products of austenite on cooling. **(10 Marks)**

b. Define the process of heat treatment and classify the various heat treatment processes. **(10 Marks)**

Module-5

9 a. Classify the different types of steels and explain the effect of alloying elements on steel. **(10 Marks)**

b. Write note on plain steels application and uses. **(05 Marks)**

c. Explain the composition, properties and uses of any two non-ferrous alloys. **(05 Marks)**

OR

10 a. Define composite materials. Mention the advantages of composite materials. **(05 Marks)**

b. Classify composite materials. **(05 Marks)**

c. With a neat sketch, explain filament winding process. **(10 Marks)**

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