CBCS SCHEME

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

18MR32

Third Semester B.E. Degree Examination, June/July 2024
Materials Science

Time: 3 hrs. Max. Marks:100

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

Module-1

1 a. Draw stress-strain carves for mild steel and describe how to find each of the properties.
   i) Yield strength
   ii) Ductility
   iii) Toughness
   iv) Ultimate tensile strength
   v) Fractures stress. **(10 Marks)**

b. Define Automic packing factor. Derive an expression for atomic factor for FCC and BCC structures. **(10 Marks)**

OR

2 a. Classify crystal imperfections in crystals. Explain in detail line imperfection. **(10 Marks)**

b. Define :
   i) Elastic strength
   ii) Stiffness
   iii) Resilience
   iv) Toughness
   v) Ductility. **(10 Marks)**

Module-2

3 a. Explain Plastic deformation of single crystal. **(07 Marks)**

b. Explain with diagram the types of fractures. **(07 Marks)**

c. What are the types of Fatigue loading? Explain them briefly. **(06 Marks)**

OR

4 a. Draw and explain S – N curve. **(07 Marks)**

b. Derive expression for stress relaxation. **(07 Marks**

c. Explain three stages of Creep. **(06 Marks)**

Module-3

5 a. Explain Hume Rothery rules for the formation of solid solution. **(10 Marks)**

b. Explain with neat phase diagram, the eutectic and eutectoid reactions. **(10 Marks)**

OR

6 a. State the Gibb's phase rule and explain with a simple example. **(10 Marks)**

b. Explain homogeneous nucleation. Discuss the significance of critical radius of nuclei. **(10 Marks)**

Module-4

7 a. Draw Fe – C equilibrium diagram and label at the field. **(05 Marks)**

b. Define the following :

i) Ferrite
ii) Austenite
iii) Cementite
iv) Martensite
v) Plarlite. **(05 Marks)**

c. Explain the effects of alloying elements on the Fe – C diagram. **(10 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. What is heat treatment? Explain Hardening and Tempering. **(05 Marks)**

c. Write a note on surface Hardening process. **(05 Marks)**

Module-5

9 a. Write the classification of Metals. Explain the properties and composition of cast iron. **(12 Marks)**

b. Discuss the Composition , Properties and Applications of Copper Alloys. **(08 Marks)**

OR

10 a. Define Composites and classify them. **(05 Marks)**

b. Sketch and explain pultrusion process. Also mention advantages and disadvantages of this process. **(10 Marks)**

c. Write a short note on Laminated composites. **(05 Marks)**

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