CBCS SCHEME

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

18AU33

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Material Science and Metallurgy

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define Atomic packing factor. Calculate the APF for HCP structure. **(08 Marks)**
b. Differentiate Edge dislocation and Screw dislocation. **(06 Marks)**
c. State and explain Fick's I and II law of diffusion. **(06 Marks)**

OR

2 a. Draw the Stress – Strain curve for ductile material with a labeling and explain. **(08 Marks)**
b. Define the following : i) Stress ii) Strain iii) Elasticity iv) Ductility v) Toughness vi) Malleability. **(06 Marks)**
c. Differentiate Slip and Twinning. **(06 Marks)**

Module-2

3 a. Explain the cup and cone fracture, with a neat sketch. **(07 Marks)**
b. Explain the Griffith's theory for Brittle fracture. **(07 Marks)**
c. Define Fatigue. Explain the stages involved in fatigue failure **(06 Marks)**

OR

4 a. Explain the factors affecting Fatigue Life. **(06 Marks)**
b. Define Creep. Explain the three stages in creep with a neat sketch. **(07 Marks)**
c. Define Stress relaxation and derive the equation for the same. **(07 Marks)**

Module-3

5 a. Differentiate Homogeneous and Heterogeneous Nucleation. **(05 Marks)**
b. Define Homogeneous and Heterogeneous Nucleation. Obtain an expression for critical radius of nucleation. **(08 Marks)**
c. Explain Hume Rothery's rule. **(07 Marks)**

OR

6 a. Explain the Gibbs Phase rule. **(05 Marks)**
b. Draw the Iron - Carbon diagram with invariant reactions. **(15 Marks)**

Module-4

7 a. Explain the steps involved in constructing a TTT diagram. **(07 Marks)**
b. Differentiate between Normalizing and Annealing. **(06 Marks)**
c. With a neat sketch, explain the Flame hardening. **(07 Marks)**

OR

8 a. Define Ferrous materials and list them. **(04 Marks)**
b. Explain the composition , properties , microstructure and application of grey cast iron and mild steel. **(16 Marks)**

Module-5

9 a. Explain the following :
i) Copper alloys ii) Aluminum alloys. **(14 Marks)**

b. List out the advantages , disadvantages and applications of non – ferrous metals. **(06 Marks)**

OR

10 a. Define Composite Materials. Explain the role of matrix and reinforcement in a composite materials. **(06 Marks)**

b. List advantages and applications of composite materials and also classify the composite materials. **(06 Marks)**

c. Explain the filament winding process, with a neat sketch. Mention is applications. **(08 Marks)**

* * * * *