CBCS SCHEME

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

17ME32

Third Semester B.E. Degree Examination, Feb./Mar. 2022
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. What is Atomic Packing Factor? Calculate APF for Body Centred Cubic (BCC). **(08 Marks)**
b. Briefly discuss the point type crystal imperfect ions. **(04 Marks)**
c. Sketch and explain the Stress – Strain Curve for mild steel. **(08 Marks)**

OR

2 a. Explain the importance of Offset yield strength, with a neat sketch. **(05 Marks)**
b. Discuss the various types of fractures in brief. **(08 Marks)**
c. Derive the expression for Stress - relaxation. **(07 Marks)**

Module-2

3 a. Discuss the mechanism of Solidification in pure metals and alloys. **(08 Marks)**
b. Define Solid Solution and explain the various types of solid solutions. **(07 Marks)**
c. List out and briefly explain Hume – Rothary rules. **(05 Marks)**

OR

4 a. What is Gibb's Phase rule and discuss the various terms involved in it? **(07 Marks)**
b. Write the general steps involved in the construction of a binary equilibrium diagram between two metals. **(06 Marks)**
c. State the Lever Rule and briefly explain the importance. **(07 Marks)**

Module-3

5 a. What is Heat treatment? What is the purpose of Heat treatment? **(08 Marks)**
b. Discuss the various types of Annealing in brief. **(05 Marks)**
c. Write briefly the Composition , Properties and Applications of Grey Cast Iron. **(07 Marks)**

OR

6 a. What are the various Surface Heat treatment methods and explain Nitriding in brief. **(08 Marks)**
b. Discuss the properties and uses of S.G. Iron. **(06 Marks)**
c. Explain the principle of Induction hardening in brief. **(06 Marks)**

Module-4

7 a. What is Ceramic? Discuss the Mechanical and Electrical behavior of Ceramics. **(08 Marks)**
b. What is Smart Material? Discuss the various applications of Smart Material. **(05 Marks)**
c. Explain the importance of Ceramic materials in our day to day applications. **(07 Marks)**

OR

8 a. Define Shape Memory Alloys and list out various applications of Shape Memory Alloys. **(06 Marks)**
b. With a neat sketch, explain the processing of plastic through Injection molding. **(07 Marks)**
c. Discuss the various steps involved in the processing of Ceramics. **(07 Marks)**

Module-5

9 a. What is Composite Materials? Explain briefly the classification of composites. (06 Marks)
b. Discuss the Foundry techniques involved in the production of Metal Matrix Composites. (06 Marks)
c. Explain the Filament Winding process, with a neat sketch. (08 Marks)

OR

10 a. Derive the equation for Young's modulus of a Composite through i) Iso – Strain and ii) Iso – Stress condition. (14 Marks)
b. A Composite material is made by using 10% by volume of Kevlar fiber and 90% epoxy matrix. If the elastic modulii of Kevlar is 130 GN/m^2 and epoxy is 4 GN/m^2, calculate the
i) Young's modulus in fibre direction.
ii) Young's modulus in transverse direction.
iii) Fraction of load carried by the fibers. (06 Marks)

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