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B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: III**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 19ME3DCMSM / 15ME3DCMSM **Max Marks: 100**
Course: Material Science and Metallurgy **Date: 15.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1. a) Compare slip and twinning mechanisms of plastic deformation. **06**

   b) Construct a stress – strain diagram of a medium carbon steel and mention all the salient points. **04**

   c) "At elevated temperatures and stresses, much less than the high-temperature yield stress, metals undergo permanent plastic deformation called creep". Illustrate and explain using creep curve. State the factors affecting creep. **10**

OR

2. a) Differentiate between ductile and brittle fracture. **05**

   b) Explain the concept of strain hardening experienced by ductile metals. **05**

   c) Discuss Fick's laws of diffusion. **10**

UNIT - II

3. a) Compare Homogenous and Heterogeneous nucleation. **05**

   b) State the Hume – Rothery rules governing the formation of solid solutions. **05**

   c) Explain with neat sketches the different types of eutectic phase diagrams. **10**

UNIT - III

4. a) Draw a neat diagram of iron – iron carbide equilibrium diagram labelling all the salient points. Discuss the various micro constituents / structures identified in Fe-FeC_3 diagram. **10**

b) Sketch and explain the continuous cooling transformation diagram for eutectoid steels. **10**

UNIT - IV

5. a) Explain any 4 types of annealing heat treatment processes. **10**

b) Highlight the composition, properties, microstructure and examples of low, medium and high carbon steels. **10**

OR

6. a) Discuss the features of Martempering process with a neat sketch. **06**

b) Point out the various applications of polymers. **04**

c) Elaborate on nitriding and carbonitriding surface hardening heat treatment methods. **10**

UNIT - V

7. a) Highlight the classification systems of composite materials based on matrix material and reinforcing material structure. **10**

b) Explain the process of filament winding with a sketch. State its advantages. **10**

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