

337353(37)

**B. E. (Third Semester) Examination,
April-May 2020**

(New Scheme)

(Mechanical Engg. Branch)

MATERIAL SCIENCE & METALLURGY

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : Attempt all questions. Part (a) from each question is compulsory. Attempt any two parts from (b), (c) and (d) of each questions. Draw neat sketches wherever necessary.

Unit-I

1. (a) Define the term Nucleation. 2
- (b) With neat sketch state briefly mechanism of solidification of pure metals and alloys. 7

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- (c) What is grain growth? Explain the effect of grain growth on properties of metals. 7
- (d) Differentiate between Homogeneous Nucleation and Heterogenous Nucleation. Give suitable sketch. 7

Unit-II

2. (a) What is strain hardening. 2
- (b) Define with example : 7
- (i) Ductility
 - (ii) Stiffness
 - (iii) Toughness
 - (iv) Hardness
 - (v) Creep
 - (vi) Brittleness
 - (vii) Fatigue
- (c) Compare : 7
- (i) Recovery and Recrystallization
 - (ii) Slip and twinning.
- (d) Explain how dislocation produces plastic deformation in materials. 7

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Unit-III

3. (a) State and write down the invariant monotectic reaction. 2
- (b) Explain and draw the cooling curve for pure iron. 7
- (c) Draw iron-carbon phase diagram and label all significant points. 7
- (d) Sketch and briefly write down the equilibrium diagram of an alloy subjected to peritectic transformation. 7

Unit-IV

4. (a) What are the purpose of heat treatment. 2
- (b) What is the usefulness of 'S' curve in the heat treatment? Explain. 7
- (c) State the objects of annealling. Write briefly about the following annealling processes : 7
- (i) Full annealling
 - (ii) Isothermal annealling
- (d) Explain different types of surface hardening methods. 7

Unit-V

5. (a) Why is alloying of metals done. 2
- (b) Give the composition, properties and uses of brass and bronze. 7
- (c) Write composition and uses of aluminum alloys. 7
- (d) Write composition and properties, application of: 7
- (i) Gun metal
 - (ii) Duralumin
 - (iii) Grey Cast iron