



P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Fourth Semester, B.E. - Industrial and Production Engineering
Semester End Examination; May / June - 2018
Material Science and Metallurgy

Time: 3 hrs

Max. Marks: 100

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

UNIT - I

- 1 a. What is space lattice in crystals? Determine the atomic packing factor of Face Centered Cubic (FCC). 8
- b. Differentiate between edge dislocation and screw dislocation. 6
- c. State and derive Fick's-II law of diffusion. 6
- 2 a. With a neat sketch, explain the three different types of diffusion mechanisms. 12
- b. With a neat graph, briefly explain comparison between true stress-strain and conventional stress-strain diagrams. Also derive the relation between true strain and conventional strain. 8

UNIT - II

- 3 a. Briefly explain Brittle fracture or type-II fracture. 5
- b. Discuss different types of fatigue protection methods. 5
- c. Explain the three stages of creep through creep curve. Define cold creep. 10
- 4 a. What is solid solution? Explain different types of solid solutions. 10
- b. Explain the construction of phase diagram using cooling curves. 10

UNIT - III

- 5 a. Draw a neat sketch of Iron-carbon equilibrium diagram and explain its phases. 14
- b. Describe the effect of alloying elements on the Fe-C diagram. 6
- 6 a. With a neat sketch, briefly explain the construction of T-T-T diagram. 10
- b. Write a note on : 10
 - i) Effect of alloying elements on T-T-T diagrams
 - ii) Non-equilibrium phases on iron and carbon

UNIT - IV

- 7 a. Explain the classification of heat treatment processes. What are the objectives of heat treatment process? 12
- b. Briefly explain Austempering and Martempering process. 8
- 8 a. Explain Cyaniding and Nitriding surface hardening processes. Mention its advantages and disadvantages. 12

- b. What are the four general methods of flame hardening? 4
- c. Discuss the composition, properties and application of spheroidal graphite Iron. 4

UNIT - V

- 9 a. Discuss the role of matrix and re-inforcement in composite materials and also explain particulate composites. 12
- b. Write a note :
 - i) Aluminum Alloys 8
 - ii) Metal-Matrix composites
- 10. With a neat sketch, explain the following processes of manufacturing Fibre Reinforced Plastics (FRP). 20
 - i) Sheet moulding compound process
 - ii) Pultrusion process
 - iii) Filament winding process

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