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# P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

Third Semester, B.E. - Mechanical Engineering

Semester End Examination; Dec. - 2019

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. Define Atomic packing factor. Find out the Atomic packing factor for BCC, FCC crystal structures. 20
2. What are defects? Explain with neat diagrams point, line, surface defects in crystals. 20

## UNIT - II

3. Draw neat sketch and stress-strain graph for ductile and brittle materials. Explain clearly the various tensile parameters. 20
4. Explain with neat sketches the various types of structure and creep mechanisms. 20

## UNIT - III

5. Explain with neat sketches the following types of phase diagrams :  
 (i) Isomorphous system (ii) Eutectic systems 20  
 (iii) Peritectic system (iv) Eutectoid systems
6. Draw neat sketch of Iron-Iron carbide diagrams, label all the fields, composition, temperatures and explain the various invariant reactions involved in it. 20

## UNIT - IV

7. With neat sketches, explain the various types of heat treatment process. Mention the critical temperatures involved in each heat treatment process. 20
8. Define Hardenability. Explain the following:  
 (i) Jominy End-Quench test 20  
 (ii) Age hardening of Al-Cu alloys

## UNIT - V

9. Explain the following :  
 (i) Polarization (ii) Passivation 20  
 (iii) Cathodic protection (iv) AISI designation and SAE designation of steel
10. Write a short note on the following :  
 (i) Galvanic cell 20  
 (ii) Stress corrosion cracking  
 (iii) Various types of steel alloys