

B.E./B.TECH. Degree Examination, December 2020

Third Semester

ME18303-Material Characterization and Metallurgy

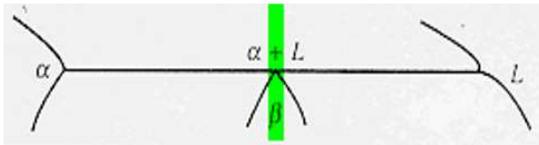
(Regulation 2016)

Time: Three hours

Maximum: 80 Marks

Answer **ALL** questions**PART A - (8 X 2 = 16 marks)**

1. Hume Rothery rule states
 - i) The atomic radii of the solute and solvent atoms must differ by not more than 15%:
 - ii) The crystal structures of solute and solvent must match.
 - iii) Maximum solubility occurs when the solvent and solute have the same valency
 - iv) All of the above
2. The following reaction is



- i) Peritectic reaction
 - ii) Eutectic reaction
 - iii) Eutectoid reaction
 - iv) None of the above
3. Annealing heat treatment performed to
 - i) Relive internal residual stress
 - ii) Refine the grain size
 - iii) Both i) & ii)
 - iv) None of the above
4. Non-equilibrium phases are shown for their time and transformation using _____
 - i) Fe-Fe₃C diagram
 - ii) TTT diagram
 - iii) CCT diagram
 - iv) TTT and CCT diagram
5. Increase in hardness of the steel will improve the wear resistance – TRUE/FALSE. Justify.
6. Distinguish the phosphorous bronze and leaded bronze.
7. Chromium enhances the corrosion resistance of steel – TRUE/FALSE.
8. Increase in hardness will decrease the brittleness – TRUE/FALSE. Justify.

PART B - (4 X16 = 64 marks)

9. (a) (i) Give example for binary isomorphous system. Also explain how to construct the phase diagram for the same from cooling curves. **(10)**
- (ii) Explain the influence of % of carbon in steel with suitable microstructures. **(6)**
- (Or)
- (b) With neat sketch explain the different invariant reactions and the resultant microconstituents of Iron-Carbon system. **(16)**
10. (a) (i) Why normalizing is preferred while compared to annealing process? Also compare the microstructures of both. **(10)**
- (ii) How Iron-Carbide diagram differ from TTT diagram with respect to microconstituents. **(6)**
- (Or)
- (b) (i) Distinguish between the carburizing and nitriding **(4)**
- (ii) With suitable example discuss any one of the selective hardening process. **(12)**
- Also mention the advantages of selective hardening method compared to bulk hardening
11. (a) (i) Discuss the composition and properties of following steels and mention their applications **(12)**
- I) Austenitic stainless steel II) Ferritic stainless steel
- (ii) Explain how the S.G iron is produced from Gray C.I **(4)**
- (Or)
- (b) (i) Write short notes on FRP. Also discuss their applications. **(8)**
- (ii) Discuss the merits and demerits of Al_2O_3 compared to SiC **(8)**
12. (a) (i) Discuss any four properties that are arrived by conducting tensile testing of steel. **(12)**
- (ii) Explain how the Vickers hardness method overcomes the disadvantages of Brinell hardness method. **(4)**
- (Or)
- (b) (i) Explain the procedure of fatigue testing method with suitable diagrams. **(12)**
- (ii) Explain where the creep strength of the metallic materials is considered to be important. **(4)**