Reg. No. : | | | | | | | | | | | | |

Question Paper Code : X 20838

B.E./B.Tech. DEGREE EXAMINATIONS, NOV./DEC. 2020
Third/Fourth Semester
Mechanical Engineering
ME 6403 – ENGINEERING MATERIALS AND METALLURGY
(Common to Automobile Engineering, Manufacturing Engineering, Mechanical and Automation Engineering)
(Regulations 2013)
(Also Common to PTME 6403 – Engineering Materials and Metallurgy for B.E. (Part- Time) – Third Semester – Mechanical Engineering – Regulations 2014)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions.

PART – A **(10×2=20 Marks)**

1. Name and explain the standard rule for the formation of substitutional type of solid solutions.
2. Name the system and sketch the labeled ideal binary phase diagrams for the system where the components are completely soluble in liquid and partially soluble in solid states.
3. What is meant by hardenability ?
4. Which type of surface hardening process that does not involve composition change ?
5. List the important properties of HSLA.
6. What are Bronzes ?
7. What is polymerization ?
8. State the advantages of fiber reinforced composites.
9. Differentiate between ductile and brittle fracture.
10. What is the difference between HRB and HRC (Rockwell 'B' scale and 'C' scale) ?

PART – B **(5×13=65 Marks)**

11. a) i) Explain the various micro constituents present in steel. **(8)**

ii) With a neat sketch, label the reactions of Fe –Fe_3C diagram. **(5)**

(OR)

b) i) Discuss the classification of cast iron and draw its microstructure. **(9)**

ii) State the properties and applications of plain carbon steel. **(4)**

12. a) Draw a neat sketch of the Isothermal Transformation diagram for Eutectoid steel and explain the constructional procedure. Label all the salient features on it. Superimpose on it a cooling curve to obtain bainitic phase. **(13)**

(OR)

b) Differentiate hardness and hardenability. Explain with neat sketch, the procedure to plot the hardenability curves for eutectoid steel in Jominy End Quench Test. **(13)**

13. a) Discuss the influence of various alloying elements in steel. **(13)**

(OR)

b) Discuss the composition, properties and typical applications of any four copper alloys. **(13)**

14. a) What is polymerization ? Explain addition polymerization and condensation polymerization with examples. **(13)**

(OR)

b) What is strengthening mechanism ? Explain the strengthening mechanism of fiber-reinforced composites. **(13)**

15. a) i) Compare Charpy and Izod Impact test. **(3)**

ii) List the applications of impact test. **(3)**

iii) Draw a typical creep curve and brief on the mechanism. **(7)**

(OR)

b) i) Discuss the role of slip and twinning in plastic deformation of materials. **(7)**

ii) Draw a typical S-N curve of fatigue testing and brief on the mechanism. **(6)**

PART – C **(1×15=15 Marks)**

16. a) Suggest a suitable material for the gear used in the gearbox of an automobile since the surface of the gear is subjected to constant wear, suggest and discuss any three methods to improve its wear resistance property. **(15)**

(OR)

b) It is required to do turning operation of mild steel shaft on a lathe machine. Suggest and discuss suitable material for the single point cutting tool for this Purpose. **(15)**

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