Reg. No. :

Question Paper Code : 71851

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fourth Semester

Mechanical Engineering

ME 2253/ME 44/ME 1253/080120017/10122 ME 304 — ENGINEERING MATERIALS AND METALLURGY

(Common to Automobile Engineering, Mechanical and Automation Engineering)

(Regulation 2008/2010)

(Common to PTME 2253/10122 ME 304 – Engineering Materials and Metallurgy for B.E. (Part-Time) Third Semester – Mechanical Engineering – Regulation 2009/2010)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is difference between cooling of a pure metal and a solid solution, from molten state?

2. What do you mean by invariant reaction?

3. State the application of isothermal transformation diagram.

4. Which type of surface hardening process that does not involve composition change?

5. What are the characteristic features of fracture surface of creep rupture component?

6. State advantages of Vickers hardness testing over other techniques.

7. Which type of stainless steel is used for surgical instruments?

8. What is the typical constituent microstructure of bearing alloy?

9. What are outstanding properties of polycarbonate?

10. List the typical application of PTFE.

11. (a) (i) Draw Iron-Iron carbide phase diagram, name the various field, line and reactions. (10)

(ii) Draw the typical microstructure of 1.2%C steel at 920°C, 780°C and 200°C. (6)

Or

(b) (i) Discuss on substitutional solid solution of isomorphous alloy system. (8)

(ii) Brief on maximum percentage of carbon in ferrite and austenite based on the interstitial sites. (8)

12. (a) (i) Brief on hardening and tempering of steel with respect to rate of cooling and tempering temperature respectively. (8)

(ii) Compare Austempering and Martempering. (8)

Or

(b) (i) Brief on Jominy end quench test and interpretation of results. (6)

(ii) Brief on the types of carburizing and need for post carburizing heat treatments. (10)

13. (a) (i) Compare Charpy and Izod Impact test. List the applications of impact test. (8)

(ii) Draw a typical S-N curve and brief on the influence of any TWO design parameters and metallurgical properties. (8)

Or

(b) (i) Discuss the role of slip and twinning in plastic deformation of materials. (6)

(ii) State the difference between properties like hardness, yield strength, ultimate tensile strength, fracture strength, creep strength, fatigue strength and impact toughness. (10)

14. (a) (i) Brief on the influence of alloying elements in steel under classification of ferrite and austenite stabilizer. (10)

(ii) List the types and their typical applications of tool steel. (6)

Or

(b) (i) What are the types of cast iron or copper alloy, their composition, properties and applications? (8)

(ii) Brief on the precipitation hardening and ageing treatment of Al-Cu alloy. (8)

15. (a) (i) Differentiate between thermoplastic and thermosetting polymers. (6)

(ii) What are fibre reinforced plastics and state its application? (6)

(iii) State the properties and applications of polyurethane or Phenol formaldehyde. (4)

Or

(b) (i) Classify engineering ceramics and list properties and applications of any TWO of them. (8)

(ii) Brief on properties and applications of any TWO polymers from the list : (8)

PMMA, PEEK, PPO, ABS and PS.
