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

Question Paper Code : 51632

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

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 – Engineering Materials and Metallurgy for B.E. (Part-Time) Third Semester – Mechanical Engineering – Regulation 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Gibb's phase rule?
2. State Hume Rothery's rules for formation of substitutional solid solutions.
3. What is quenching? List some of the quenching medium generally used in industries.
4. What is the significance of TTT diagram in the heat treatment of steel?
5. What are the primary effects of chromium, and copper as alloying elements in steel?
6. What are super alloys?
7. What is meant by the term 'unsaturated molecule'? State its significance in plastics.
8. What are sialons? State their applications.
9. What is the effect of the grain size on the mechanical properties of the materials?
10. What is S-N diagram? What is the significance of it?

PART B — (5 × 16 = 80 marks)

11. (a) With the help of the Fe-C equilibrium diagram describe completely the changes that take place during the slow cooling of 0.5% carbon steel from liquid state. (16)

Or

(b) Metal 'A' has melting point of 1000°C. Metal 'B' has melting point of 500°C. Draw one phase diagram (between the elements 'A' and 'B') for each of the following conditions.

(i) The two elements exhibit unlimited solid solubility. (8)

(ii) The alloy system shows formation of two terminal solid solutions and a Eutectic point, at 50% A and at 700°C. (8)

12. (a) Distinguish between 'hardness and "hardenability". With suitable sketches, explain the Jominy hardness test for hardenability. (16)

Or

(b) (i) Discuss different types of annealing processes. (8)

(ii) Explain normalizing and induction hardening. (8)

13. (a) (i) With a neat sketch, explain precipitation hardening. (8)

(ii) State the composition, properties and uses of bearing alloys. (8)

Or

(b) Write short notes about the following materials in terms of composition, properties and applications.

(i) Maraging steels (4)

(ii) Alpha-beta brasses (4)

(iii) Austenitic stainless steels (4)

(iv) Ferrite stainless steels. (4)

14. (a) What do you understand by polymerization? With the help of suitable examples, Compare and contrast the process of addition polymerization and condensation Polymerization. (16)

Or

(b) (i) Write short note about the different types of matrix materials and reinforcement materials used to make polymer matrix composites. (8)

(ii) Discuss the properties and applications of Al_2O_3 and SiC. (8)

15. (a) Explain the different types of mechanical properties and mechanism of plastic deformation by slip and twinning. (16)

Or

(b) (i) Draw the S-N curve for mild steel and aluminium and explain its features. Explain the procedure used to obtain S-N diagram. (10)

(ii) Explain briefly about charpy impact test. (6)
