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J 3327

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2009.

Fourth Semester

(Regulation 2004)

Mechanical Engineering

MH 1151 — ENGINEERING MATERIALS AND METALLURGY

(Common to Automobile Engineering, Production Engineering)

(Common to B.E. (Part-Time) Third Semester Mechanical Engineering
Regulation 2005)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What do you mean by substitutional solid solution? Briefly explain the rules governing the formation of substitutional solid solution.
2. Name and explain any one type of binary solid to solid state transformation reaction with ideal phase diagram.
3. Name and explain any one subcritical case hardening treatment.
4. With heat treatment cycle, explain the conventional normalising treatment for hyper-eutectoid steel.
5. Write short notes on the types of stainless steels.
6. With composition, property and application explain
 - (a) Tin bronze
 - (b) Naval brass

7. With property and application, explain the following polymers :

- (a) PVC (b) PMMA

8. Write the general mechanical properties of ceramics.

9. Distinguish between slip and twinning.

10. What is creep? Draw a typical creep curve and show different creep stages on it.

PART B — (5 × 16 = 80 marks)

11. (a) With ideal phase diagram, cooling curves and example, explain the following binary systems. Also name the system :

(i) Two components completely soluble in liquid and completely insoluble in the solid state.

(ii) Two components completely soluble in the liquid and completely soluble in the solid state. (16)

Or

(b) Sketch neatly the ideal Iron-Carbide binary equilibrium diagram, indicating temperatures, composition and different phases present. Also explain the peritectic reaction of this system. (16)

12. (a) Explain the construction procedure of isothermal transformation diagram for 1080 steel. Neatly sketch the diagram, indicating different phases on it. (16)

Or

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

13. (a) (i) State the effects of adding following alloying elements to steel- Chromium, Manganese, Vanadium, Tungsten, Silicon and Molybdenum. (6)

(ii) Give the composition, property and uses of SG Iron, 18-4-1 HSS and Monel metal. (10)

Or

(b) (i) With part of phase diagram and relevant sketches, explain the precipitation hardening treatment of Al-Cu alloys. (8)

- (ii) What are the characteristics of bearing alloys? With composition, property and use, explain bearing bronze and admiralty gun metal. (8)

14. (a) (i) What are the special properties of plastics that make them useful engineering materials? (5)
- (ii) How do thermoplastics differ from thermosetting materials? Explain. (5)
- (iii) Write short notes on particle reinforced composites and fibre reinforced composites. (6)

Or

- (b) (i) With suitable applications, explain the following ceramic materials : Alumina, Silica, Silicon carbide silicon nitride. (8)
- (ii) Write short notes on :
(1) PE (2) PP (3) ABS (4) Urea and phenol formaldehyde. (8)
15. (a) (i) What does impact test signify? Explain impact Izod test with neat sketches? (8)
- (ii) What is fatigue failure? How fatigue test is carried out? Explain. (8)

Or

- (b) (i) What do you mean by 'Engineering Stress' and 'True stress'? Explain. (3)
- (ii) Draw typical engineering stress versus engineering strain curves for ductile and brittle materials and explain. (6)
- (iii) Differentiate between Ductile fracture and brittle fracture. (4)
- (iv) What do you mean by DBTT? Explain. (3)