Reg. No. : ☐☐☐☐☐☐☐☐☐☐☐☐☐

Question Paper Code : 72144

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Third/Fourth Semester

Mechanical Engineering

ME 6403 – ENGINEERING MATERIALS AND METALLURGY

(Common to Automobile Engineering, Manufacturing Engineering, Mechanical and Automation Engineering)

(Regulations 2013)

Time : Three hours　　　　　　　　　　　　　　　　　Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the types of solid solutions?

2. Why is carbon solubility more in Austenite?

3. What are the principal advantages of austempering over conventional quenching and temper method?

4. Mention few applications of induction hardening system.

5. What are the effects of adding Si in steels?

6. Differentiate Brass from Bronze.

7. Differentiate between composite and an alloy.

8. Write short notes on PET.

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 following invariant reactions with reference to a phase diagram:

　　　　　(1) Eutectic reaction, (2) Eutectoid reaction.　　　　(6)

　　　(ii) Draw iron-iron carbide phase diagram and mark on it all salient temperatures and composition fields.　　　　(7)

Or

　　(b) What are the micro-constituents of iron-carbon alloys? Explain the general characteristic of each.　　　　(13)

12. (a) Compare and contrast the process of full annealing, stress relief annealing, recrystallization annealing, and spheroidise annealing. (13)

Or

(b) Define hardenability. Describe the test procedure to determine hardenability of steel. (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 meant by 'polymer'? Discuss the properties, applications and chemical structure of any four types of polymers. (13)

Or

(b) Give any two important properties of ceramics. Write short notes on any four ceramic materials. (13)

15. (a) Discuss the mechanisms of slip and twinning in detail. (13)

Or

(b) Sketch and describe the following hardness tests. (i) Brinell (ii) Vickers. (13)

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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