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

Question Paper Code : 53305

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2019.

Third/Fourth Semester

Mechanical Engineering

ME 6403 – ENGINEERING MATERIALS AND METALLURGY

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

(Regulation 2013)

(Also common to PTME 6403 – Engineering Materials and Metallurgy for B.E. Part Time – Third Semester – Mechanical Engineering – Regulation 2014)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the term solid solutions?
2. How will you classify steels?
3. What is austempering?
4. Name any two shallow hardening processes.
5. What are the effects of adding Si in steels?
6. Differentiate Brass and Bronze.
7. Distinguish thermosetting and thermoplastic polymers.
8. What is meant by metal matrix composites? Give one example each to matrix material and reinforcements used.
9. What are the characteristic features of fracture surface of creep rupture component?
10. State the advantages of Rockwell hardness testing over other techniques.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain the following invariant reactions with reference to a phase diagram : (6)

(1) Eutectic reaction,

(2) Eutectoid reaction.

(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.

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

(ii) Discuss the concept involved in martempering. (5)

Or

(b) (i) Brief on Jominy end quench test and interpretation of results. (7)

(ii) Brief on the types of carburizing and need for post carburizing heat treatments. (6)

13. (a) Discuss the properties and the applications of the following :

(i) Tool steels (7)

(ii) HSLA (6)

Or

(b) Explain age hardening of Al-Cu with the help of phase diagram.

14. (a) Explain the following :

(i) Engineering ceramics. (7)

(ii) Formaldehydes (3)

(iii) PMMA. (3)

Or

(b) (i) Explain the Engineering polymers in detail. (8)

(ii) State the properties and uses of reinforced composites. (5)

15. (a) Name and explain the different types of hardness tests with respect to the procedure, relative advantages and disadvantages.

Or

(b) With geometry and arrangement of impact test specimens explain Charpy and Izod test with its relative advantages and disadvantages.

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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