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**Question Paper Code : 27362**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Third Semester

Manufacturing Engineering

ME 6403 — ENGINEERING MATERIALS AND METALLURGY

(Common to Fourth Semester Automobile Engineering, Mechanical and Automation Engineering and Mechanical Engineering)

(Regulations 2013)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw a typical cooling curve of pure metal and a solid solution.
2. What do you mean by invariant reaction?
3. What do you mean by hardenability?
4. Which type of surface hardening process that does not involve composition change?
5. Which type of stainless steel is used for surgical instruments?
6. What is the typical constituent microstructure of bearing alloy?
7. What are the outstanding properties of PMMA?
8. List the typical applications of  $Al_2O_3$ .
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 × 16 = 80 marks)

11. (a) (i) Draw Iron–Iron carbide phase diagram, name the various field, line and reactions. (10)
- (ii) Draw the typical microstructure of 0.5% C steel at 920° C, 780° C and 200° C. (6)

Or

- (b) (i) Discuss on substitutional solid solution. (8)
- (ii) Compare the microstructure, properties and application of any TWO kind of cast iron. (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. (8)
- (ii) Brief on the types of carburizing and need for post carburizing heat treatments. (8)
13. (a) (i) Brief on the influence of alloying elements in steel under classification of carbide former and non carbide former. (8)
- (ii) List the types and their typical applications of stainless steel. (8)

Or

- (b) (i) What are the types of titanium alloy, their composition, properties and applications? (8)
- (ii) Brief on the precipitation hardening and ageing treatment of Al-Cu alloy. (8)
14. (a) (i) Classify composite materials and list TWO properties and application of them. (12)
- (ii) State the properties and applications of PSZ or SiC. (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: PTFE, PC, PET, ABS and PS. (8)

15. (a) (i) Compare Charpy and Izod Impact test. (4)  
(ii) List the applications of impact test. (4)  
(iii) Draw a typical creep curve and brief on the mechanism. (8)

Or

- (b) (i) Discuss the role of slip and twinning in plastic deformation of materials. (8)  
(ii) Draw a typical S-N curve of fatigue testing and brief on the mechanism. (8)
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