

Reg. No. :

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**Question Paper Code : 20809**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2018.

Third/Fourth Semester

Mechanical Engineering

ME 6403 — ENGINEERING MATERIALS AND METALLURGY

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

(Regulations 2013)

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

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Draw a typical phase diagram of Isomorphous alloy system.
2. Write a typical peritectoid reaction.
3. What is the difference between stress relief and recrystallisation?
4. What makes nitriding different from rest of case hardening process, besides composition?
5. What is the difference between malleable and spheroidal cast iron?
6. What are the characteristics of a super alloy?
7. What are outstanding properties of PSZ?
8. List the typical applications of PTFE.
9. What are the characteristic features of ductile fracture surface?
10. Under what condition, twinning is the preferred mechanism of plastic deformation?

PART B — (5 × 13 = 65 marks)

11. (a) (i) Draw Iron-Iron carbide phase diagram, name the various field, line and reactions. (10)  
(ii) Draw the room temperature microstructure of eutectoid steel. (3)

Or

- (b) (i) Discuss on substitutional solid solution with an example. (10)  
(ii) What type of solid solution is Fe-C, interstitial or substitutional? Where does C atoms occupies in Ferrite? (3)
12. (a) Brief on various phase transformation with continuous cooling transformation diagram super imposed on Time-Temperature-Transformation (TTT) diagrams.

Or

- (b) (i) Brief on Jominy end quench test and interpretation of results. (9)  
(ii) Brief on the tempering process. (4)
13. (a) (i) Brief on the influence of alloying elements : Co, Ni, Mo and V. (4)  
(ii) List the types and their typical applications of Tool steel. (9)

Or

- (b) Brief on the precipitation hardening and ageing treatment of Al-Cu alloy.
14. (a) Classify composite materials and list properties and application of FRP and Metal Matrix.

Or

- (b) (i) Classify engineering ceramics and list properties and applications of SiC and Si<sub>3</sub>N<sub>4</sub>. (5)  
(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) Draw a typical creep curve and brief on the mechanism. (9)

Or

- (b) (i) Compare Rockwell and Brinell hardness test. (4)  
(ii) Draw a typical S-N curve of fatigue testing and brief on the mechanism. (9)

PART C — (1 × 15 = 15 marks)

16. What is the material choice, type of processing, microstructure and mechanical properties, of any Three sub components of a typical lathe machine?