

Reg. No. :

**Question Paper Code : 50874**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

Third/Fourth Semester

Mechanical Engineering

ME 8491 – ENGINEERING METALLURGY

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

(Regulations 2017)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define the term phase diagram.
2. What is Bainite and what is the temperature range of its formation?
3. What are the principal advantages of austempering over conventional quenching and tempering method?
4. Mention the purpose of flame hardening.
5. What is the difference between malleable and spheroidal cast iron?
6. Give the composition of 18-4-1 HSS.
7. Differentiate between composite and an alloy. Give one example.
8. List the important properties of Elastomer
9. What properties are determined from tensile testing of metallic products?
10. Mention the importance of Creep.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Draw the Iron – Iron carbide phase diagram. Name the various fields, line and reactions and discuss about them. (10)
- (ii) Discuss the similarities and difference between substitutional and interstitial solid solutions. (3)

Or

- (b) (i) Distinguish between hypoeutectoid and hyper eutectoid steel. (6)
- (ii) Give the classification of steel and also mention its properties and application. (7)
12. (a) (i) Compare and contrast the process of martempering with austempering. (10)
- (ii) What makes nitriding different from the rest of case hardening? (3)

Or

- (b) (i) Define hardenability. Describe the test procedure to determine hardenability of steel. (10)
- (ii) Mention the importance of CCT diagram. And write short notes on critical cooling rate. (3)
13. (a) (i) List the composition and their typical applications of HSLA. Highlight the important properties of HSLA steel. (7)
- (ii) Discuss the composition, properties of any four copper alloys. (6)

Or

- (b) (i) Write short notes on the precipitation hardening and ageing treatment of Al-Cu alloy. (10)
- (ii) Elaborate the various factors influencing structure of cast iron. (3)
14. (a) (i) Write down the classification and applications of composites. (6)
- (ii) Express your views about FRP. (7)

Or

- (b) (i) Differentiate between thermoplastic and thermosetting plastic. (6)
- (ii) Discuss the properties, applications and chemical structure of any four types of polymers. (7)



15. (a) (i) Sketch and describe the following hardness tests (1) Brinell (2) Vickers. (6)  
(ii) What are the types of indenters and major loads used in Brinell Hardness test? Explain about them. (7)

Or

- (b) (i) Discuss the characteristics of ductile fracture and brittle fracture. (7)  
(ii) Write in detail about UTS. (6)

PART C — (1 × 15 = 15 marks)

16. (a) Discuss the effects and characteristics of alloying elements in steel with relevant examples. (15)

Or

- (b) (i) Compare slip and twinning. (8)  
(ii) Illustrate the reason for surface hardening of stainless steel and mention its advantages. (7)