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

**Question Paper Code : 80231**

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

Third/Fourth Semester

Mechanical Engineering

ME 8491 — ENGINEERING METALLURGY

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

(Regulation 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Differentiate an alloy from pure metal.

2. State the reaction that initiates the formation of Austenite in iron-iron carbon diagram.

3. Define hardenability of a material.

4. Why is the full annealing of a steel component performed?

5. List two important types of fracture.

6. What is the prominent mechanism of plastic deformation in metals and define it?

7. List the major alloying elements of the aluminium alloys 6061 and 7075.

8. Cite two reasons for the extensive usage of ferrous alloys in engineering applications.

9. List two important engineering ceramics used in the high temperature applications.

10. Why is the use of composites increasing over metallic alloys in aerospace industries?

PART B — (5 × 13 = 65 marks)

11. (a) State what is a solid solution in alloys and with the help of neat sketches explain the isomorphous, eutectic, eutectoid, peritectic and peritectoid reaction of alloys.

Or

(b) With the help of a neat sketch of a Iron-carbon diagram for steel, explain the various phases in the iron-carbon phase diagram.

12. (a) Though the polymers are neither as strong nor as stiff as metals, why are they used largely in engineering applications? Explain in detail the property and application of any five commonly used Engineering Polymers.

Or

(b) Explain in detail various types of composites.

13. (a) A gears surface should resist wear and tear, but the core material remains soft to withstand the shock loads. Explain in detail the various types of heat treatment process suitable to get such a property in the gear.

Or

(b) What will be the resultant microstructure and hardness of a 0.76% carbon steel which is heated to approximately 800°C followed by air cooling, furnace cooling, oil quenching and water quenching?

14. (a) Sketch the microstructure in different types of cast iron and explain in detail how the affects the property of cast iron.

Or

(b) Explain in detail the effect of major alloying element in copper alloys, state the name, properties and applications of those alloys formed.

15. (a) Draw neatly the stress-strain diagram of a ductile material and discuss the salient mechanical properties and features of the curve along with their physical significance.

Or

(b) Define fatigue and discuss briefly the steps involved in the construction of a S-N curve.

PART C — (1 × 15 = 15 marks)

16. (a) From the tensile stress-strain behavior for the plain carbon steel alloy shown in figure, determine the following:

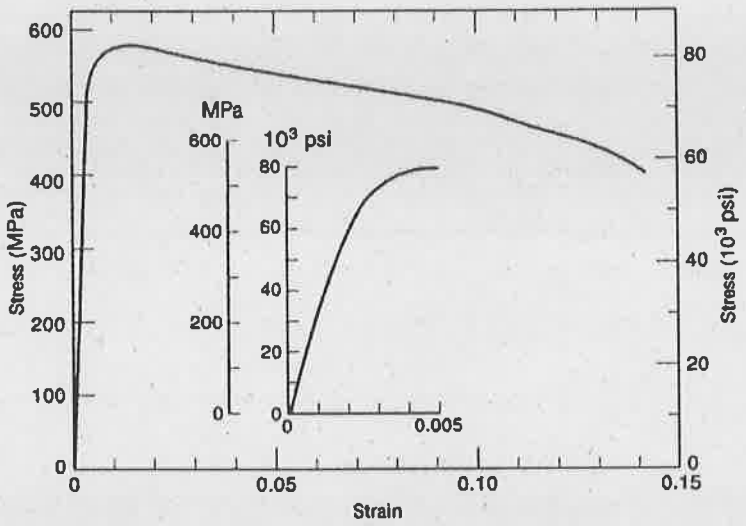
(i) The modulus of elasticity.

(ii) The ultimate tensile strength

(iii) The yield strength at a strain offset of 0.002.

(iv) The maximum load that can be sustained by a cylindrical specimen having an original diameter of 10 mm.

(v) The change in length of a specimen originally 250 mm long that is subjected to a tensile stress of 300 MPa.




Or

(b) Rank the following iron-carbon alloys and associated microstructures from the highest to the lowest tensile strength:

(i) 0.3 wt%C with spheroidite

(ii) 0.3 wt%C with coarse pearlite

(iii) 0.65 wt%C with fine pearlite

(iv) 0.65 wt%C with coarse pearlite

(v) 0.20 wt%C with spheroidite

Justify this ranking.