MATERIAL FOR ENGINEERING

BRANCH :- MECHANICAL/ AUTOMOBILE / METALLURGY

These Questions are made for your previous exam, from PYQ and some internet….(Notes reference le Lena ek baar)

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🔔 ***Note:*** Pehle apna 2024 ka PYQ Zarur dekh lena

🔷 UNIT 1: Basics of Engineering Materials

1. What is a unit cell? Describe the atomic arrangement in BCC, FCC, and HCP crystal structures.
2. Derive the Atomic Packing Factor (APF) for Face-Centered Cubic (FCC) structure.
3. Describe the different types of microscopes used for analyzing materials.
4. Explain the specimen preparation procedure for metallographic examination of materials.
5. Write short notes on mechanical, thermal, and physical properties of metals with examples.

🔷 UNIT 2: Steels and Cast Irons

6. Classify different types of cast irons. Discuss the microstructure, properties, and applications of:
   - Grey Cast Iron
   - Ductile Cast Iron
7. Differentiate between low, medium, and high carbon steels — mention properties and uses.
8. What is tool steel? Describe types like cold working, hot working, and high-speed steel (HSS).
9. What is stainless steel? Classify and mention applications of each type.
10. How are cast irons and steels designated as per BIS/ASME standards?
11. Select appropriate materials (cast iron or steel) for applications like:
    - Shafts, axles, bolts
    - Household utensils
    - Antifriction bearings

UNIT 3: Non-Ferrous Alloys

12. Write the chemical composition, properties, and applications of:
    - Brass
    - Bronze
    - Duralumin
    - Hindalium
13. Discuss the engineering applications and properties of nickel and its alloys.
14. Explain bearing materials like:
    - White metal (Sn-based)
    - Self-lubricating bearings
    - Aluminum bronze

UNIT 4: Non-Metallic and Advanced Materials

15. Compare thermoplastics and thermosetting plastics with examples and applications.
16. What are elastomers? List common types and their industrial applications.
17. Define ceramics. Classify types of ceramics and discuss their uses in engineering.
18. What are composite materials? Classify and explain the applications of:
    - Laminated composites
    - Fiber reinforced composites
19. Write short notes on:
    - Nano materials
    - Biomaterials
    - Smart materials
20. Explain the BIS designation system for non-metallic materials.

UNIT 5: Heat Treatment Process

21. Draw and explain the Iron-Carbon equilibrium diagram with all invariant reactions.
22. What is the purpose of heat treatment? Explain mechanism in brief.
23. Differentiate between:
    - Annealing vs. Normalizing
    - Hardening vs. Tempering
24. Explain the case hardening processes:
    - Carburizing
    - Nitriding
    - Cyaniding
25. Describe various phases and critical temperatures in iron-carbon phase diagram.

UNIT 6: Surface Treatment for Materials

26. What is corrosion? Explain its types and methods to prevent corrosion.
27. Write notes on:
    - Galvanic series
    - Electrochemical cell
28. Describe surface coating by electrolysis. Draw and explain setup and working.
29. Explain the difference between electrolytes and non-electrolytes. Give examples.
30. What are surface protection treatments? Explain at least three methods used in industry.

Tips for Preparation

- Focus on diagrams + explanation (especially Unit 1 & 5).
- Case studies like material selection for axles or bearings are often asked.
- Heat treatment processes ke temperature ranges & purpose ratta maar lo .