Answer ALL questions

PART – A   **(10×2=20 Marks)**

1. What is the application of lever rule in phase diagram ?

2. What are the solid state analogue of the eutectic and peritectic reactions ?

3. What is martensite ? What are the two different morphologies of martensite ?

4. What is the use of time-temperature transformation (T-T-T) curves ?

5. From the galvanic series, cite three metals or alloys that may be used to galvanically protect nickel in the active state.

6. The thermal conductivity of a plain carbon steel is greater than for a stainless steel. Why is this so ?

7. How are fibers classified based on the diameter and the character ?

8. How will the crystallinity of a polymer be affected by the addition of a plasticizer ?

9. What are the factors that affect the Critical Shear Stress ?

10. What are Neumann bands ? How are they formed ?

PART – B **(5×13=65 Marks)**

11. a) i) What are the various allotropic forms of Pure iron ? Explain them with a neat cooling curve diagram. **(8)**

    ii) Explain in detail the different micro-constituents of Fe-C system. **(5)**

        (OR)

    b) i) What is the effect of carbon percentage on the properties of steel ? Explain. **(5)**

    ii) Classify steels based on carbon content and discuss on the properties and applications of the various types of steels. **(8)**

12. a) i) List down the objectives of Heat treatment. **(5)**

    ii) What are the changes that take place at various temperatures during tempering ? Explain. **(8)**

        (OR)

    b) Compare and discuss on the different surface hardening processes.

13. a) What is a White Cast iron ? How is Malleable Cast iron produced from White cast iron ?

        (OR)

    b) Discuss on the various Aluminium and its alloys and their importance in engineering industry.

14. a) Briefly explain on the following :
    i) Ultrahigh molecular weight polyethylene. **(6)**
    ii) Liquid Crystal Polymers. **(7)**

        (OR)

    b) A continuous and aligned glass fiber-reinforced composite consists of 40 vol% of glass fibers having a modulus of elasticity of 69 GPa and 60 vol% of a polyester resin that, when hardened, displays a modulus of 3.4 GPa.
    i) Compute the modulus of elasticity of this composite in the longitudinal direction.
    ii) If the cross-sectional area is 250 mm^2 and a stress of 50 MPa is applied in this longitudinal direction, compute the magnitude of the load carried by each of the fiber and matrix phases.
    iii) Determine the strain that is sustained by each phase when the stress in part (b) is applied.

15. a) Discuss in detail the two mechanisms of Plastic Deformation of a single crystal.

(OR)

b) Discuss in detail the various factors that affect the mechanical properties of materials.

PART – C   (1×15=15 Marks)

16. a) Discuss in detail the heat treatment process involved to negotiate the effects of cold working in a material.

(OR)

b) Creep is extremely structure sensitive. Discuss on the factors that affect the creep and also throw some light on the mechanism of creep.

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