BT-6/M-24

STRUCTURE AND PROPERTIES OF FIBRES

Paper–PEC-TEX- 318A

Time : Three Hours]   [Maximum Marks : 75

Note : Qusetion-1 is compulsory. Attempt *five* questions in all selecting at least *one* question from each unit.

Compulsory Question

1. (i) What is the primary factor influencing the morphology and order in fibre structure?

    (a) Temperature

    (b) Pressure

    (c) Orientation.

    (ii) Which technique is commonly used for the measurement of crystallization in fibers?

    (a) Electron microscopy

    (b) X-ray diffraction

    (c) Infrared spectroscopy.

    (iii) Which man-made fiber is known for its excellent moisture absorption properties?

    (a) Polyester (PET)

    (b) Acrylic

    (c) Viscose.

(iv) Which fiber is derived from wood pulp?

    (a)   Wool

    (b)   Silk

    (c)   Viscose.

(v) Which theory explains the orientation of polymer chains in fiber structure?

    (a)   Crystallization theory

    (b)   Random coil theory

    (c)   Orientation theory.

(vi) What is the primary method for determining the physical structure of fibers?

    (a)   Scanning electron microscopy

    (b)   Fourier transform infrared spectroscopy

    (c)   X-ray diffraction.

(vii) Which fiber is known for its exceptional strength and elasticity?

    (a)   Wool

    (b)   Silk

    (c)   Nylon.

(viii) What does the yield point on a stress-strain curve indicate?

    (a)   Maximum stress a fiber can withstand before breaking

    (b)   Point where the fiber begins to deform plastically

    (c)   Elastic limit of the fiber.

(ix) What does the term "creep" refer to in the context of fiber behavior?

    (a)   Sudden fracture of a fiber under stress

    (b)   Gradual deformation of a fiber over time under constant load

    (c)   Elastic recovery of a fiber after deformation.

(x) Which model is commonly used to simulate the viscoelastic behavior of textile fibers?

    (a)   Simple spring model

    (b)   Dash pot model

    (c)   Hooke's law model.

(xi) What is the primary factor affecting the frictional properties of fibers?

    (a)   Length of the fiber

    (b)   Surface roughness of the fiber

    (c)   Fiber diameter.

(xii) What type of behavior is exhibited by fibers undergoing stress relaxation?

    (a)   Gradual increase in stress over time

    (b)   Gradual decrease in stress over time under constant strain

    (c)   Sudden increase in stress leading to fracture.

(xiii) Static charge generation in fibers is primarily influenced by :

    (a)   Moisture content

    (b)   Color intensity

    (c)   Fiber length.

(xiv) Which type of transition phenomenon is characterized by a gradual change in properties, such as glass transition?

    (a)   First order transition

    (b)   Second order transition

    (c)   Third order transition.

(xv) What is the typical effect of temperature on the dielectric properties of fibers?

    (a)   Decreases with temperature

    (b)   Increases with temperature

    (c)   Remains constant with temperature. $(15 \times 1 = 15)$

UNIT–I

2.   Explain some of the fine structure models proposed to describe fiber morphology and the application of X-ray in fiber morphology.   (15)

3.   Explain the chemical structure of the following fibers

    (a)   Cotton.

    (b)   Wool.

    (c)   Polyester. $(5 \times 3 = 15)$

UNIT–II

4.   What is mechanical conditioning? How does it influence the tensile properties of fibers? Explain the terms modules, yield point, and work of rupture with a suitable stress-strain curve. What do you understand by primary and secondary creep? Discuss the various factors influencing the creep.   (15)

5. Explain a method to determine the friction among the fibers. Define the coefficient of friction and how the lubricants affect the coefficient of friction in fibers. How do different structural and operational parameters affect fiber friction? (15)

UNIT–III

6. "Fiber is transversely isotropic for optical property" justifies the statement. Explain *two* methods to describe the refractive index of fibers with non-circular cross-section. (15)

7. How do you calculate the directly and indirectly attached water molecules in cotton fibers? What is swelling anisotropy? Explain why the swelling anisotropy of nylon is less than one. (15)

UNIT–IV

8. Discuss the first-order and second-order transition phenomenon in textile fibers. Explain the glass transition temperature and factors influencing this. Also, explain a method to measure the glass transition temperature of textile fibers. (15)

9. How is the dielectric constant of a fiber measured? Discuss along with the principle of measurements. Also, discuss the various factors influencing the dielectric constant. Explain the concept of static charge generation in textiles. (15)

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