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## Sixth Semester B.Tech. Degree Examination, July/August 2022

### Textile Fibre Physics

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

#### Module-1

- 1 a. With the help of relevant examples, explain the role of crystalline and amorphous regions in textile fibres. (08 Marks)
- b. With the help of line diagram and graph, explain how crystallinity is found using DGC and give any two disadvantages of DGC. (08 Marks)
- c. Nylon fibre showed following parameters when tested for crystallinity:  
 $\rho_c = 1.27 \text{ g/cm}^3$  ;  $\rho_a = 1.09 \text{ g/cm}^3$  ;  $\rho = 1.14 \text{ g/cm}^3$   
 Determine crystallinity of nylon. (04 Marks)

**OR**

- 2 a. With the help of graphs and figures, explain how WAXS is used to find fine structural features of fibre. (08 Marks)
- b. With the help of graphs, explain how quantitative and qualitative analysis of chemical structure of fibre is done using IRS. (08 Marks)
- c. State how scanning electron microscope is used to study the surface structure of fibres. (04 Marks)

#### Module-2

- 3 a. With the help of neat sketches, explain the microstructure of wool and cotton fibre. (10 Marks)
- b. A fibre of oven dry weight 200 gms absorbs 8.9 gms of moisture. Find MR and MC of fibre and predict the fibre. Name the fibre with approximately 2 times, 4 times and 0.1 times of MR of this fibre. Draw MR V/s RH for above fibres and give reason for the difference in MR of these fibres. (10 Marks)

**OR**

- 4 a. Draw and explain the crystal unit of N-6, molecular structure of PET and arrangement of molecules in acrylic fibres. (08 Marks)
- b. Discuss the molecular theory of moisture hysteresis in cellulosic fibres. (08 Marks)
- c. Show that  $S_v = S_A S_L + S_A + S_L$  and  $S_A = S_d^2 + 2S_d$  (04 Marks)

#### Module-3

- 5 a. Draw stress-strain curves for any five fibres and give values of Tenacity, initial modulus and % elongation in SI units. (08 Marks)
- b. What do you understand by dynamic mechanical property? Give a summary representation for same. (08 Marks)
- c. Define weak link effect. With suitable illustrations, show that this effect is less for synthetic fibres than natural fibres. (04 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.  
2. Any revealing of identification, appeal to evaluator and /or equations written eg. 42+8 = 50, will be treated as malpractice.

OR

- 6 a. A filament of length 100 mt weighing 2.0 gm tested for tensile properties with 50 cm test length. Filament broke at a load of 600 gm and length of the fibre at breakage was 55 cm. Determine tenacity of filament in GPT, GPD, NPT and CNPT and also find elongation % at break and draw stress/strain curve for the fibre. (08 Marks)
- b. Briefly explain factors affecting tensile properties of textile materials. (08 Marks)
- c. A fibre of 40 mm length weighing 0.5 mg, extends to 50 mm on application of load and returns to 41 mm on removal of load. At 30% elongation, fibre breaks which require 500 gf. Find the elastic recovery percent and tenacity of fibre in g/den. (04 Marks)

**Module-4**

- 7 a. Define the term friction. State and explain Amonton's law of friction, with respect to fibre friction. (10 Marks)
- b. Explain the importance of studying shear and compressional property of fibre in understanding the comfort and handle properties of garments. (10 Marks)

OR

- 8 a. Explain how friction plays dual role in mechanical processing of textiles and describe DFE in wool fibres. (08 Marks)
- b. Define intrinsic birefringence and how it is measured. (08 Marks)
- c. What are static and kinetic frictions? (04 Marks)

**Module-5**

- 9 a. State and problems created by presence of static charges in textile and garment industry and explain any two remedies for the same. (10 Marks)
- b. State the importance of studying thermal conductivity (K), Thermal expansion (E) and specific heat of fibres. State why  $K_{11} > K_1$  and  $E_{11} < E_1$  (10 Marks)

OR

- 10 a. Explain in brief any one method employed to measure static charge on fibre and explain contact theory of static charge generation. (10 Marks)
- b. With the help of a circuit diagram, explain the method of determining electrical resistance of fibre and show the graph for effect of MR on electrical resistance of fibres. (10 Marks)

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