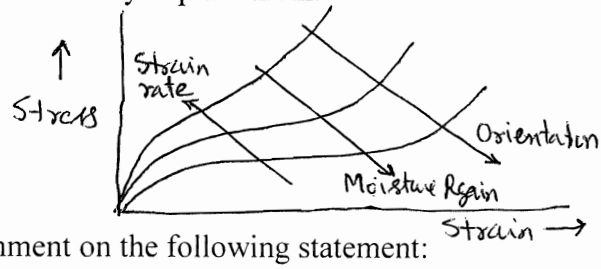
TTL 211 Structure and Properties of Fibers

Major Exam **22nd Nov 2008** **Maximum Marks 40** **1-3 pm**

Part A

Use separate answer sheets foe PartA & Part B

Q.No.1A. State whether the variation of the stress-strain curves with morphology/ testing parameters as shown below is correct. If incorrect, make suitable changes in the curves and briefly explain them. **(3x3=9)**



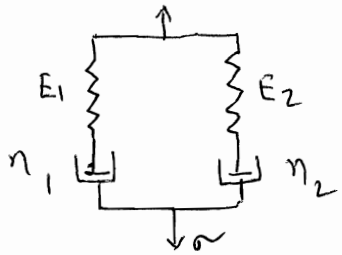
Q No 2AComment on the following statement:

(a) Elastic recovery of nylon is related to breaking of hydrogen bonds in amorphous regions. (b) Viscose rayon has low modulus and large permanent deformation in wet state. (c) Wool fibers follow distinct path in tensile deformation to that of in recovery.(d) Initial modulus, strength and elongation of cotton decreases with increasing moisture regain. **(2x5=10)**

Q.No 3A In a following mechanical model for visco-elastic behaviour of fibres, 1% strain is applied at t=0. Calculate the stress after 100seconds. **6**

Constant

$\varepsilon(t) = \varepsilon(0)$



$E_1 = 10^9$ Pa $E_2 = 2 \cdot 10^9$ Pa

$\eta_1 = \eta_2 = 10^{11}$ Pa

Q No4A (a) Wool has large extension to break(~40%) whereas cotton has low extension to break(~10%), explain. (b)What is mechanical conditioning, explain. **(5)**

Part B

Que1B. The birefringence (Δn) value of a drawn (a) PP fiber is 0.035 (b) PET fiber is 0.18 and (c) Acrylic fiber is 0.000 (d) Triacetate fiber is -0.005. Explain the differences in values. Can you comment on their relative degree of molecular orientation based on this data? **(4)**

Que 2B. Justify the following statements – **(3x2=6)**

(a)Synthetic fibers are generally more lustrous than natural fibers. How do you make them delustered? (b)The mechanical hysteresis in fibers is related to hysteresis in their moisture absorption? Discuss it with reference to cotton and nylon fibers. (c) The glass transition temperature (Tg) of fibers can vary with RH (0 % to 100%). Out of the following fibers, which of these fibers will show this behaviour? : Cotton, Polypropylene, Nylon, Polyester.

Useful Expressions: $\sigma = \sigma_0 e^{-t/\eta}$; $\varepsilon = \frac{\sigma_0}{E}(1 - e^{-t/\eta})$