Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 09

B.Tech.(Textile) (2011 Onwards) (Sem.–6)

THEORY OF TEXTILE STRUCTURE

Subject Code : BTTE-601

Paper ID : [A2760]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Answer briefly :

a) The packing fraction of a 30 tex viscose rayon yarn is 0.5. If a polypropylene yarn of same diameter and packing fraction is to be made, what will be its count?

b) A blended yarn is made up of black polyester and cotton fibres. The denier of black polyester fibre is 1.2 and the micronaire value of cotton was 3.9. What will be the visual appearance of the spun yarn? Give appropriate justification for your answer.

c) Compare the migration profile of rotor and ring spun yarn.

d) Define packing coefficient of a yarn. What should be its value for an ideal yarn?

e) What are the physical interpretations of minimum and maximum values of mean fibre position values?

f) What are the assumptions of Peirce geometrical model of woven fabric?

g) Draw a typical bending hysteresis curve for a woven fabric.

h) Calculate the diameter in millimeter of a 20^s N_e yarn.

i) Explain the significance of drape coefficient.

j) State the assumptions of Olloffson's model.

SECTION-B

2. Define shear stiffness of a fabric and explain the tensile behaviour of woven fabric.

3. Define various parameters related to bending behaviour of fabrics. Also show that in a square woven jammed fabric $\theta = 60°$, $c = 21\%$ and fabric cover = 82.13%.

4. A plain woven fabric made of 20 tex yarn with 20 × 25 EPI & PPI and of crimp 5% & 12% respectively. Calculate θ, h, 1, D & p values based on geometrical model.

5. Define '*axial*' and '*preferential*' migrations with necessary sketches. Justify and show the path variations of fibres in a yarn when the fibres differ in length and flexural rigidity.

6. Deduce the relation between contraction factor and twist angle. Clearly mention the assumptions you made.

SECTION-C

7. a) Write a short note on the twist tenacity relationship of spun yarn and hence highlight the modified approach by Hearle and El-Sheikh. (5)

   b) Derive the following relations considering the fabric geometrical model:

   $P = D\sin\theta + (1-D\theta)\cos\theta$

   $H = D(1-\cos\theta) + (1-D\theta)\sin\theta$ (5)

8. a) Deduce the relation between the yarn modulus and fibre modulus for a spun yarn.

   b) State the factors which assist and which disturb fibre packing in a yarn. (6+4)

9. a) Calculate the geometrical parameters i.e, ℓ_1, ℓ_2, p_1 p_2, θ_1, θ_2, h_1, h_2 for a plain woven fabric with following parameters :

   EPI × PPi = 40 × 30, Yarn count = 20 tex and c_1 & c_2 8% and 10% respectively.

   b) Also calculate the fractional cover of the fabric and calculate the weight of the fabric in g/sq.m.

   c) Write a short note on fabric buckling. (4+4+2)