[Total No. of Questions - 9] [Total No. of Printed Pages - 4] (2064)

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B. Tech 6th Semester Examination

Theory of Textile Structures

TE-6004

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : This question paper consists of five sections A, B, C, D & E. Section E is compulsory and each sub-question carries 2 marks. Sections A, B, C, & D consist of two questions each. Answer five questions in all including Section E, taking at least one from rest of the sections.

SECTION - A

1. (a) With the help of necessary sketches find the path variation of the fibres in a blended yarn when the components are differing in

   (i) Fibre Initial Modulus

   (ii) Fibre friction
   Also justify the variation of their path, if any.

   (b) Define axial and preferential migration with necessary sketch. Why migration is necessary? What are the significances of the extreme values of MFP? Discuss a method to study migration. (20)

2. (a) If the helix angle of a yarn at its surface is 200, what would be the contraction and retraction factors? What would be these values if the angle changes by 2 times?

(b) Calculate the initial count of a rayon yarn if its final linear density ought to be 20 tex and twist 750 per meter.

(c) Deduce the relation between contraction and retraction in yarn. (20)

SECTION - B

3. Deduce the relation between yarn modulus and fibre modulus under small extension. Also discuss the factors which help packing of fibres and the factors which disturb packing. (20)

4. Discuss twist tenacity relationship in spun yarn and hence discuss the modified approach by Hearle & El-Sheikh. Clearly mention the role of different parameters which can have their impact on the behaviour of spun yarn. (20)

SECTION - C

5. (a) Explain the concept of jammed structure. What is the value of maximum possible ends and picks per centimeter of a $\frac{3}{1}$ t will, woven from 20 tex warp and 25 tex weft yarn by assuming Ashenhurst's theory?

(b) Explain the mechanism of deformation of fabric in warp/ weft direction and bias direction. (20)

6. Calculate the geometrical parameters i.e, l_1, l_2, p_1, p_2, θ_1, θ_2, h_1, h_2 of a plain woven fabric with following particulars:

EPI × PPI = 40 x 30, yarn count = 30 tex and c_1, c_2 being 8% and 12% respectively.

Also calculate the following

(i) Fractional cover of the fabric

(ii) Weight of the fabric in g/sq. m.

Examine whether the fabric has reached to jammed state. (20)

SECTION - D

7. (a) Discuss in detail the structural differences of ring, rotor, compact and friction spun yarns. Also discuss the structure property relationship of such yarns.

(b) What are the factors affecting the GSM of the woven and knitted fabric? Write a brief note on fabric objective measurement technique. (20)

8. (a) If a woven fabric is produced from 30 tex yarn of 200 GSM with 10% crimp, what is the value of picks and ends per centimeter?

(b) Derive the following relationship between cloth weight and cover factor:

$$K = 1\frac{1}{6}\sqrt{w(n_1 + n_2)}$$ (20)

In which condition maximum possible cover factor is 28?

SECTION - E

9. (a) What do you mean by crimp interchange in woven fabric?

(b) State the assumptions of Olloffson's model.

(c) State the factors which can affect the bending rigidity of fabric.

(d) Insertion of twist in a continuous multi filament yarn lowers its strength, even then twist in it is inserted-why?

(e) Which mechanism is responsible for long term migration and which one is for short term migration.

(f) Show the nature of curve of a tensile testing when the TM in yarn is changing,

(g) Calculate the tightness factor of knitted fabric with the following parameters:

No of needles = 120, Course length = 500mm and yarn count = 20^s N_e.

(h) Draw a typical stress stain curve for a woven fabric.

(i) State the problems associated with ideal yarn and suggest the remedial measures, if any.

(j) Deduce the relation between the yarn extension and fibre extension under small load. (10×2=20)