

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Sem-I Regular Examination January / February 2011

Subject code: 712501N

Subject Name: Theory of Textile Structure I

Date: 31 /01 /2011

Time: 02.30 pm – 05.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

Q.1 Assuming constant value of Poisson Ratio σ_y , derive equation to predict filament strain ϵ_f for large value of ϵ_y . How the same will be modified if the σ_y is incorporated? **14**

Q.2 (a) How yarn diameter can be worked out using microscope with projector and cross wire? What is Schwarz's constant? Why it is accounted? **07**

(b) Derive Platt's equation for low strains $\epsilon_f = \epsilon_y \cos^2 \theta$. Which assumptions are made? **07**

OR

(b) Define contraction and retraction. Derive equation for contraction in terms of surface twist angle α . **07**

Q.3 State and define various migration parameters along with expressions. Explain fully the migration analysis as carried out by Riding using statistical correlogram approach, and interpret. **14**

OR

Q.3 The stress – strain curve for the acetate yarn is defined by $y = a + b\epsilon_f$. Derive the expression to predict the yarn tenacity in terms of surface – twist angle α . Define α . **14**

Q.4 Derive the expression to predict the tenacity of filament yarn using energy method as treated by Treolar and Riding. **14**

OR

Q.4 Explain the rupture behaviour of spun yarns by the modified qualitative Yarn Modulus **14**

approach and derive $\frac{\text{Yarn Modulus}}{\text{Fibre Modulus}} = \cos^2 \alpha (1 - k \csc \alpha)$ giving the expression for k.

Q.5 (a) Write in short on structural features of compact spun yarn. **06**

(b) Calculate following: **08**

1. 200/78/200 Polyester filament yarn has a packing factor of 0.85. The yarn is subjected to a strain up to 16%. Assuming coaxial helical geometry and constant volume, will the yarn be able to sustain the strain if the filament breaking strain is 14.0%?
2. The breaking load of a multifilament acrylic yarn (150/74/0) is 400 g. What will be the tenacity in gpd ?

OR

Q.5 (a) Write a short note on fiber packing in yarns **06**

(b) Calculate following **08**

1. Hamilton yarn geometer gave the following values:
 - i) Yarn major dia = 280 microns
 - ii) Yarn minor dia = 170 microns
 If the yarn count is 18^s Ne and fiber specific volume is 0.657 cm³/g, estimate packing factor.
2. What will be the value of the mean fiber position for perfect migration for a staple yarn if $V_y = 1.25$ and $\tau = 45$
