Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 712501N **Date: 23-12-2013**

Subject Name: Theory of Textile Structure - I

Time: 10.30 am – 01.00 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	**(a)**	Write on any one modern method of measuring yarn diameter.	**07**
	(b)	Write a short note on different ways in which fiber packing occurs in yarns.	**07**
Q.2	**(a)**	Discuss in detail material and process related factors influencing yarn surface profile.	**07**
	(b)	What is migration? Derive expressions for migration parameters like Mean fiber position(Y bar), Root mean square deviation (amplitude)(D) and Rate (intensity) of migration (I).	**07**
		OR	
	(b)	For ideal and perfect migration, prove that RMS deviation (D) is 0.3.	**07**
Q.3	**(a)**	Prove theoretically that the number of filaments crossing corresponding to any given increment of length is constant. Also derive equation to find out contraction in filament.	**12**
	(b)	Calculate diameter of individual filament of polyacrylonitrile yarn having 76/34/0 specification.	**02**
		OR	
Q.3	**(a)**	Write short note on qualitative view of spun yarn mechanics.	**07**
	(b)	Explain the basic structural features of open end yarn.	**07**
Q.4		Derive theoretical prediction equation of yarn tenacity for $\varepsilon_f < 10$ %	**14**
		OR	
Q.4		Derive an equation to predict filament strain ε_f for large value of ε_y	**14**
Q.5		Derive an equation of triangular wave form of first cycle of migration pattern assuming linear approximation.	**14**
		OR	
Q.5		Calculate Following:	**14**

(i) 176/70/200 Polyester filament yarn has a packing factor of 0.80. The yarn is subjected to a strain up to 15%. Assuming coaxial helical geometry and constant volume, will the yarn be able to sustain the strain if the filament breaking strain is 14.0%?

(ii) The breaking load of a PFY, with denier 155/74/0, is 400 g. What will be the tenacity in gpd?

(iii) Hamilton yarn geometer gave the following values:

Yarn major dia = 280 microns

Yarn minor dia = 170 microns

If the yarn count is 18^s Ne and fiber specific volume is 0.657 cm^3/g, estimate packing factor.

(iv) What will be the value of the mean fiber position for perfect migration for a staple yarn if $V_y = 1.25$ and $\tau = 45$

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