Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER I - EXAMINATION – SUMMER 2017

Subject Code: 2712508 **Date:09/05/2017**

Subject Name: Theory of Yarn Structure

Time:02:30 pm to 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	**(a)**	Write a short note on different ways in which fiber packing occurs in yarns.	**07**
	(b)	What are the constituents of yarn quality for spinner, weaver and knitter?	**07**
Q.2	**(a)**	Define contraction and retraction. Derive equation for contraction in terms of surface twist angle **α**.	**07**
	(b)	Write in short on various structural features of air jet spun yarn.	**07**
		OR	
	(b)	Write short note on qualitative view of spun yarn mechanics.	**07**
Q.3	**(a)**	With the help of theoretical method derive an equation to find out yarn diameter for filament yarn.	**07**
	(b)	Calculate following 1. 155/72/200 Polyester filament yarn has a packing factor of 0.92. The yarn is subjected to a strain up to 11.0 %. Assuming coaxial helical geometry and constant volume deformation, will the yarn be able to sustain the strain if the filament breaking strain is 9.6 %? 2. What will be the value of the mean fiber position for perfect migration for a staple yarn if $\mathbf{V_y}$ = 1.2 and $\boldsymbol{\tau}$ = 44	**07**
		OR	
Q.3		Derive the expression to predict the tenacity of filament yarn using energy method as treated by Treolar and Riding.	**14**
Q.4		Derive theoretical prediction equation of yarn tenacity for $\boldsymbol{\varepsilon_f} < 10$ %	**14**
		OR	
Q.4		Derive an equation to predict filament strain $\boldsymbol{\varepsilon_f}$ for large value of $\boldsymbol{\varepsilon_y}$.	**14**
Q.5	**(a)**	Prove that the length of fiber in a yarn is proportional to the square of radius of yarn. Write in brief on three basic parameters of migration.	**08**
	(b)	Write in short on structural features of compact spun yarn.	**06**
		OR	
Q.5		Explain the rupture behavior of spun yarns by the modified qualitative approach and derive $\frac{\text{Yarn Modulus}}{\text{Fibre Modulus}} = \cos^2\alpha(1 - k\operatorname{cosec}\alpha)$ giving the expression for k.	**14**

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