Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME - SEMESTER–I(New course)• EXAMINATION – WINTER- 2015

Subject Code: 2712508 **Date: 01/01/2016**

Subject Name: Theory of Yarn Structure

Time:2:30 pm to 5:00 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)**	What are the constituents of yarn quality for spinner, weaver and knitter?	**07**
	(b)	Write a short note on different ways in which fiber packing occurs in yarns.	**07**
Q.2	**(a)**	With suitable diagram, explain microscopic method for evaluating yarn diameter. What is Schwarz's constant?	**07**
	(b)	Derive Platt's equation for low strains $\varepsilon_f = \varepsilon_y \sec^2\theta$. What are the assumptions made?	**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 retraction in filament yarn.	**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		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.5		Calculate Following:	**14**

(i) 176/74/250 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 160/74/0, is 400 g. What will be the tenacity in gpd?

(iii) Hamilton yarn geometer gave the following values:
Yarn major dia = 240 microns
Yarn minor dia = 130 microns
If the yarn count is 36^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 $\mathbf{V_y} = 1.25$ and $\boldsymbol{\tau} = 45$

****