Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

ME Semester –I Examination Feb. - 2012

Subject code: 712501N **Date: 11/02/2012**
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)**	With the help of low strain model to predict filament strain, prove that $\varepsilon_y^{-1}\sec^2\theta = \varepsilon_f^{-1}$. Also write on various assumptions and limitations of the model. Draw a graph of relative filament strain v/s relative radial position taking the value of α as **32°**.	**12**
	(b)	Calculate the strain on filament (ε_f) at relative radial position **(r/R)=0** if the yarn strain (ε_y) is **8%.**	**02**
Q.2	**(a)**	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**
	(b)	Write a short note on twist and fiber packing.	**07**
		OR	
	(b)	For ideal and perfect migration, prove that RMS deviation (D) is 0.3.	**07**
Q.3		Write in detail on measurement of migration parameters with the help of tracer fiber technique as carried out by Riding. What is called a serial correlation coefficient?	**14**
		OR	
Q.3		Derive an equation to predict filament strain for large value of yarn strain (up to 40%).	**14**
Q.4	**(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 polypropylene yarn having 76/34/0 specification.	**02**
		OR	
Q.4		Explain the rupture behaviour 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**
Q.5	**(a)**	Explain the effect of yarn structural parameters on any one fabric property.	**06**
	(b)	Calculate following:	**08**

	1.	If for staple yarn, fibre radius is 80 microns, staple length is 32 mm, **α** is 23 degrees, migration period is 3 cm, μ =0.29, find the value of the ratio of yarn modulus : fibre modulus.	
	2.	The breaking load of a multifilament nylon yarn (150/74/0) is 350 g. What will be the tenacity in gpd?	
		OR	
Q.5	**(a)**	Explain the basic structural features of open end yarn.	**06**
	(b)	Calculate following	**08**
	1.	Hamilton yarn geometer gave the following values: i) Yarn major dia = 250 microns ii) Yarn minor dia = 160 microns If the yarn count is 18^s Nm and fiber specific volume is 0.63 cm^3/g, estimate packing factor.	
	2.	What will be the value of the mean fiber position for perfect migration for a staple yarn if $\mathbf{V_y}$ = 1.23 and $\boldsymbol{\tau}$ = 44	

****