Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

M. E. - SEMESTER – I • EXAMINATION – SUMMER • 2014

Subject code: 712501 **Date: 13-06-2014**

Subject Name: Theory of Textile Structure - I

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 mark.**

Q.1 **(a)** Discuss in detail material and process related factors influencing yarn surface profile. **07**

(b) Derive Plattôs equation for low strains $\varepsilon_f = \varepsilon_y \sec^2\theta$. What are the assumptions made? **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 **07**

1. 145/72/200 Polyester filament yarn has a packing factor of 0.92. The yarn is subjected to a strain up to 14.0 %. Assuming coaxial helical geometry and constant volume deformation, will the yarn be able to sustain the strain if the filament breaking strain is 12.3 %?
2. What will be the value of the mean fiber position for perfect migration for a staple yarn if $V_y = 1.22$ and $\tau = 44$

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 $\varepsilon_f < 10$ % **14**

OR

Q.4 Derive an equation to predict filament strain ε_f for large value of ε_y. **14**

Q.5 **(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 **14**

$$\frac{\text{Yarn Modulus}}{\text{Fibre Modulus}} = \cos^2 Ŭ(1 ï kcosecŬ)$$

giving the expression for k.

****