

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER- I • EXAMINATION – WINTER 2014

Subject Code: 2712508**Date: 07/01/ 2015****Subject Name: Theory of Yarn Structure****Time: 02:30 p.m. to 05:00 p.m.****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 briefly on the structural features of yarn. Write in detail on any one of them. **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 **07**
1. 145/72/200 Polyester filament yarn has a packing factor of 0.92. The yarn is subjected to a strain up to 10.0 %. Assuming coaxial helical geometry and constant volume deformation, will the yarn be able to sustain the strain if the filament breaking strain is 9.3 %?
 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 $\epsilon_f < 10\%$ **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
- $$\frac{\text{Yarn Modulus}}{\text{Fibre Modulus}} = \cos^2 \tilde{\alpha} (1 + k \csc \tilde{\alpha})$$
- giving the expression for k.
