

GUJARAT TECHNOLOGICAL UNIVERSITY**M. E. - SEMESTER – I • EXAMINATION – WINTER 2012****Subject code: 712501****Date: 08/01/2013****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 marks.

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

(b) Write a short note on yarn density and packing factor. **07**

Q.2 (a) How yarn diameter can be ascertained using Hamilton yarn geometer? **07**

(b) Write in detail on effect of disturbing factors, with reference to twist, causing deviation of real yarn structure from that of ideal yarn. **OR 07**

(b) Write in detail on open and hexagonal close packing of fibres in the yarn. **07**

Q.3 The stress – strain curve for the acetate yarn is defined by $y = a + b\epsilon^r$. **14**
Derive the expression to predict the yarn tenacity in terms of surface – twist angle α . Define α .

OR

Q.3 Calculate Following: **14**

(i) 180/78/200 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 multifilament acrylic yarn (155/74/0) is 400 g. What will be the tenacity in gpd?

(iii) Hamilton yarn geometer gave the following values:

Yarn major dia = 280 microns

Yarn minor dia = 170 microns

If the yarn count is 18^s Ne and fiber specific volume is 0.657 cm³/g, estimate packing factor.

(iv) What will be the value of the mean fiber position for perfect migration for a staple yarn if $V_y = 1.25$ and $\tau = 45$

Q.4 Derive the expression to predict the tenacity of filament yarn using energy method as treated by Treolar and Riding. **14**

OR

Q.4 Explain the rupture behaviour of spun yarns by the modified qualitative approach and derive Yarn Modulus **14**

$$\frac{\text{Yarn Modulus}}{\text{Fibre Modulus}} = \cos^2 \alpha (1 - k \csc \alpha)$$

giving the

expression for k.

Q.5 Derive an equation of triangular wave form of first cycle of migration pattern assuming linear approximation. **14**

OR

Q.5 (a) Write in short on structural features of compact spun yarn. **07**

(b) Write in short on structural features of OE Spun yarn. **07**
