BT-6/M-17: 8674
TT-302A: Theory of Textile Structure

Time: 3 hrs]   [Max. Marks: 100

Attempt any five questions in all, selecting at least one question from each unit. All questions carry equal marks.

Sl No		Marks
	Unit-1	
1.	(a) What is the significance of limit of twist? Deduce the theoretical maximum twist for an ideal helical yarn.	14
	(b) What Twist Multiplier (Tm) will be used for a polyester spun yarn to have the same twist angle that does for a cotton yarn having 4.5 (Tm). The packing fractions of both the yarns are same. (Assume the necessary parameters)	6
2.	(a) An open packed ideal helical yarn consists of 5 layers. Then find out the number of fibres in each layer, total number of fibres in the yarn, packing coefficient of the yarn and the radius of the yarn.	10
	(b) Draw with a neat figure a hexagonal closed packed yarn having 2 cores.	4
	(c) Discuss the significance of Schwarz's constant. Also deduce a relationship between Schwarz's constant and number of fibres in the yarn cross-section.	6
	Unit-2	
3.	(a) Discuss the geometrical explanation of fibre migration in a yarn. Also discuss effect of various fibre parameters on migration behaviour.	10
	(b) Explain the different experimental methodology used for the evaluation of migration. Also describe the different parameters used to characterize the migration phenomenon.	10
4.	(a) Explain the mechanism of the fiber migration behavior in a yarn structure. Also Specify the different mathematical conditions required for the fiber migration of a seven ply yarn structure.	12
	(b) Explain the different types of zonal distribution occurred for individual fibers in different types yarns.	8
	Unit 3	
5.	(a) Explain the mechanism of catastrophic and normal yarn breakages with neat and labeled diagrams. Also discuss the various factors which affect the nature of breaks with relevant load elongation curves.	10
	(b) An ideal helical yarn having maximum twisted is undergone a tensile test. It is found that the yarn extension is same as the central filament. Hence find out the filament extension at the outermost layer.	10

6.	(a) Derive an expression for extension of a continuous filament yarn with the idealized helical structure under large strain.	14
	(b) Determine the modulus of a continuous nylon filament yarn under small strain with the idealized helical structure having twist contraction factor is 1.1 and the young's modulus of Polyester filament is 2800 MN/m^2.	6
	Unit 4	
7.	(a) Discuss the conditions of jamming and also mention its advantages for analysis in fabric woven structure.	6
	(b) Discuss the fabric cover factor and its significance. Also deduce the following relationship for a square jammed plain woven fabric using Peirce's flexible model [warp cover factor (K_1) and weft cover factor (K_2)]. $$\sqrt{1 - \frac{196}{K_1^2}} + \sqrt{1 - \frac{196}{K_2^2}} = 1$$	14
8.	(a) A 1/1 plain cotton square fabric is to be produced from 36 Ne yarn. The crimp of yarn and areal density of the fabric is 8% and 130 grams/m^2 respectively. Determine the number of yarns per centimetre and the fabric fractional cover.	8
	(b) Discuss the important inferences of Peirce's flexible model. Also derive a suitable mathematical expression for the angle of yarn axis to the plane of fabric (θ) and crimp of fabric.	12