KUMARAGURU
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Register Number:……

M.TECH DEGREE EXAMINATIONS: APRIL / MAY 2023

(Regulation 2018)

Second Semester

TEXTILE TECHNOLOGY

P18TME0072**:** Structural Mechanics of Fabrics

COURSE OUTCOMES

CO1: Analyze the geometry and construction of various fabrics and relate the geometry with fabric properties.
CO2: Formulate equations for prediction of tensile properties of various fabrics and explain the reasons for such behavior.
CO3: Explain the relationship between shear and bending deformation and fabric drape and mechanical properties.
CO4: Apply the knowledge of Dimensional properties and Relaxation – shrinkage in designing knitted garments.
CO5: Describe the theories on Fabric Bending, bending stiffness, and bending hysteresis.

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions: -
PART A (10 x 1 = 10 Marks)

1. What will be the fractional cover of the woven fabric having thread diameter ‘d’ and gap between adjacent thread ‘s’? CO1 [K4]

   a) d/s b) d x s
   c) d/(d+s) d) s/(d+s)

2. Choose the correct sequence of the woven fabric during tensile loading from the following CO1 [K4]

   1. Crimp interchange – De crimping – Fibre extension – Final breakage
   2. Crimp interchange - Fibre extension – De crimping – Final breakage
   3. De crimping – Fibre extension - Crimp interchange – Final breakage
   4. De crimping – Crimp interchange– Fibre extension – Final breakage

   a) 1 b) 3
   c) 2 d) 4

3. In load elongation behavior of woven fabric, the initial modulus of fabric CO2 [K4]

   a) Increases with increase in crimp b) Increases with increase in cover
   c) Decreases with increase in crimp d) Decreases with decrease in cover

4. To avoid premature buckling during shear test on fabric CO3 [K4]

a) Compressive force is applied
b) Tensile force is applied
c) Thicker sample is engaged
d) Smaller sample is engaged

5. Bending rigidity of fabrics is related to young's modulus by the following relationship CO3 [K3]

a) B= E I
b) $B=E^2 I$
c) $B=E I^2$
d) $B=E^2 I^2$

6. Match the elements of **Group I** and **Group II** CO2 [K2]

Group I	**Group II**
A. Tenacity	1. $CN\ mm^2$
B. Bending Rigidity	2. mm
C. Curvature	3. CN/Tex
D. Elongation	4. mm^{-1}

a) A-1; B-2; C-3; D-4
b) A-2; B-4; C-3; D-1
c) A-3; B-1; C-4; D-2
d) A-2; B-4; C-1; D-3

7. In shear deformation of a material, by uniform extension in one direction and contraction in a perpendicular direction is CO4 [K3]

a) Simple shear strain
b) Pure shear strain
c) Alternate shear strain
d) complex shear strain

8. Spirality is NOT influenced by the following factor CO4 [K4]

a) Cam angle
b) Feeder
c) Twist
d) Needles

9. Choose the 'CORRECT STATEMENT' from the following CO5 [K4]

i. Crease recovery is highest for thick and dense fabric
ii. Tensile strength of fabric improves with greater float length
iii. Strength CV of yarn does not affect weavability
iv. Higher drape coefficient indicates stiffer fabric

a) i, ii
b) i, iii
c) i, iv
d) ii, iii

10. Consider the following Assertion [A] and Reason [R] CO5 [K2]

[A] Changes of dimension after knitting can create major problems in garments and fabrics

[R] Satisfactory relaxation technique is used to control the dimension changes

a) [A] is right [R] is wrong
b) [A] is right [R] is right
c) [A] is wrong [R] is right
d) [A] is wrong [R] is wrong

PART B (10 x 2 = 20 Marks)

11.	Relate fabric crimp height and thread spacing.	CO1	[K3]
12.	How to calculate the fabric cover factor?	CO1	[K4]
13.	Write the principle adopted during modeling the tensile load curve.	CO2	[K3]
14.	List out the parameters consider for modelling anisotropy tensile properties.	CO2	[K3]
15.	State the importance of fabric bending behavior.	CO3	[K2]
16.	Relate bending stiffness and bending hysteresis.	CO3	[K4]
17.	Give the general assumptions imposed in the geometry of plain knitted structure.	CO4	[K1]
18.	Bifurcate the difference between two- and three-dimensional drape.	CO4	[K3]
19.	Outline the term spirality.	CO5	[K2]
20.	Enlist the various dimensional properties occurred in fabrics.	CO5	[K4]

PART C (6 x 5 = 30 Marks)

21.	Describe the racetrack model for plain weave fabrics.	CO1	[K4]
22.	Illustrate and explain the tensile stress-strain curve of woven fabric.	CO2	[K4]
23.	Summarize the fabric bending theory.	CO5	[K4]
24.	Interpret the shear stress-strain curve of woven fabric.	CO3	[K4]
25.	Discuss the Munden loop model.	CO4	[K5]
26.	Describe the significance of tightness factor in knitted fabric.	CO4	[K4]

Answer any FOUR Questions

PART D (4 x 10 = 40 Marks)

27.	Explain in detail the Pierce cloth geometry with their assumptions.	CO1	[K4]
28.	Describe the various factors affecting the tensile properties of woven fabric.	CO2	[K4]
29.	Discuss the importance of fabric drape and mechanical properties of woven fabric.	CO3	[K4]
30.	Summarize the Spirality of knitted fabrics.	CO4	[K4]
31.	Describe the bending behavior of woven fabric with empirical modelling.	CO5	[K4]

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