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## Fourth Semester B.Tech. Degree Examination, July/August 2022 Textile Mechanics and Calculations

Time: 3 hrs.

Max. Marks: 100

*Note: Answer any FIVE full questions, choosing ONE full question from each module.*

### Module-1

- 1 a. Convert the following:
  - I. To cm i) 05 Nanometer ii) 05 Angstroms iii) 05 micrometer iv) 05 gigameter.
  - II. Convert 500g/Tex into gpd, N/Tex and CN/Tex. (07 Marks)
- b. Diameter of yarn in indirect system is  $d_{(in)} = \frac{1}{28\sqrt{Ne}}$  where d = diameter in inches and Ne = New English count. Express the same formula for diameter in mm and count in Tex system. (07 Marks)
- c. Mass in mg of 1km of a filament is termed as linear density of filament in millitex, a measure of its fineness. Derive the formula for linear density of a filament with circular cross-section of diameter 'd' cm and density 'ρ' g/cm<sup>3</sup>. (06 Marks)

OR

- 2 a. Fig.Q.2(a) below represents a package of yarn wound on a cylindrical tube. Calculate the volume of yarn on the package. If the density of the yarn on package is 1.2g/cm<sup>3</sup>, find the length of the yarn on the package assuming linear density of yarn as 20 Tex. (10 Marks)

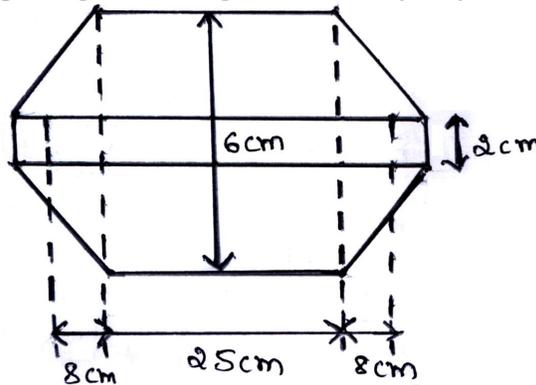


Fig.Q.2(a)

- b. A fibre with diameter of 20 μm has linear density of 210 mtex. Another fibre of same type has diameter of 16μm. Calculate the linear density of another fibre. (05 Marks)
- c. A fibre blend has two fibres A and B. Yarn produced by them has 40 fibres of A and 85 fibres of B. Find the percentage of A and B by number and find the proportion of A and B by mass if A has linear density of 165mtex and B has linear density of 195m tex. (05 Marks)

**Module-2**

- 3 a. Define various length parameters in fibre. (04 Marks)
- b. Compare fineness of the following fibres.
- Cotton fibre with hair weight of  $200 \times 10^{-8}$  g/cm.
  - A flax fibre strand with cross sectional area of  $0.9 \times 10^{-5}$  cm<sup>2</sup> and density of 1.5g/cm<sup>3</sup>.
  - A silk fibre with diameter 20µm and density 1.33g cm<sup>3</sup>.
  - A polyester filament of 8.5 denier.
  - A nylon filament of 0.54 Tex. (08 Marks)
- c. A polymer melt ( $\rho = 0.95$ g/cm<sup>3</sup>) is being melt spun through a spinnerette of 1000 holes with through put rate  $W = 300$ g/min and velocity of winding  $V_L = 300$ mt/min. Determine denier of overall filament and individual filament. If the above filaments are two stage drawn with draw ratio of 1.5 and 2.0, determine final denier of the individual filaments. (08 Marks)

**OR**

- 4 a. Find the tenacity of viscose rayon in CN/d tex if the linear density of fibre is 225 denier and breaking load is 7.5 Newton. (07 Marks)
- b. If a fibre has linear density  $LD = 300$ mtex, and if its breaking load is 100MN and  $\rho = 1.29$ /cm<sup>3</sup>. Find tensile strength of fibre in kN/cm<sup>2</sup>. (07 Marks)
- c. Find the weight of the water in 100kg of cotton if moisture regain is 8.5%. (06 Marks)

**Module-3**

- 5 a. A shuttle leaves the shed of 16m/sec. If the retardation during its passage through the shed is 1.0m/sec<sup>2</sup> and time for the passage is 0.05 sec. Determine the speed of the shuttle as it leaves the shuttle. (07 Marks)
- b. A shuttle of a conventional loom moves a distance of 180cm from box to box in the time it takes crank shaft to rotate through 210°. If the speed of the room is 200rpm, calculate shuttle speed. (07 Marks)
- c. Find the production of comber in kg/hr from the following data:  
 Length fed/nip = 6.0mm  
 Waste = 16%  
 Number of heads = 06  
 Linear density of lap fed = 68KTex  
 Nips/min = 180  
 Efficiency = 90%. (06 Marks)

**OR**

- 6 a. 1000mt of certain filament has a weight of 32gm. Find its count in Tex, millitex, K.tex, decitex, denier, Ne, worsted and metric system. (07 Marks)
- b. Define the meaning of Ne, Worsted, metric, Tex, resultant, denier and average count. Find which among the following is finest. 50 decitex, 200Nm, 120Ne and 50 denier. (07 Marks)
- c. Two-rovings of CV of 8% each one are fed into spinning zone. If spinning zone adds 8% CV. Find the CV of output yarn and find the CV of 3 ply yarn produced from this yarn. (06 Marks)

**Module-4**

- 7 a. A yarn is fed to a tension device consisting of two discs which apply a force of 400mN. If input tension is 100mN and frictional coefficient  $\mu = 0.3$  find output tension. (07 Marks)
- b. Calculate the time required to wind 180kgs of 45 tex cotton yarn on 10 drums. The actual production/drum/minute is 500mts. (07 Marks)
- c. A Warper beam contains 12600mts of Warp wound on it. The number of ends in the warp is 420 and weight of the full beam is 120kgs. If the weight of empty beam is 30kgs. Find the count of the yarn on the beam. (06 Marks)

**OR**

- 8 a. A 100m is designed to run at 500ppm. If the fabric width is 2.5m and weft crimp is 8%. Find weft insertion rose. (07 Marks)
- b. Find the time required to wind 10kg of 40 tex yarn, when winding machine works of 1000m/min with efficiency of 90%. (07 Marks)
- c. 9454kgs of 20 Tex cotton yarn is required to be used for preparing warp for cloth having 3120 ends. Calculate the length of warp which could be prepared from this quantity of yarn. Allow one percent waste. (06 Marks)

**Module-5**

- 9 a. A cotton fabric is produced from 20 Tex warp and weft with 30 ends and picks per cm. Assume 10% crimp in warp and weft direction determine a real density of fabric in GSM. (10 Marks)
- b. In a loom running at 220PPM (220rpm), the shuttle begins to move at  $100^\circ$  past beat up and comes to rest at  $225^\circ$  past beat up. How long the shuttle moving? (05 Marks)
- c. Write a brief note on fabric inspection. (05 Marks)

**OR**

- 10 a. A 100m of reed width 114cm runs at 200PPM. Determine the speed of a similar loom with reed width of 228cm. (05 Marks)
- b. The yarn width in the reed is 100cm and the shuttle length with curved ends neglected is 30cm. The loom speed is 200PPM and  $100^\circ$  crank shaft rotation is available for shuttle traversing through the shed. If the retardation is  $950\text{cm}^2/\text{sec}$ . Determine: i) Mean velocity ii) Max velocity iii) Minimum velocity ie velocity before the shuttle enters the box. (10 Marks)
- c. A warp is entered in to  $72^s$  stock port reed with 02 ends/dent. The warp width in the reed is 45 inches and the fabric width is 43 inches. Calculate: i) Number of ends/dent in the reed ii) Number of ends/inch in the cloth. (05 Marks)

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