TF: Textile Engineering and Fibre Science

Duration : Three Hours   Maximum Marks :150

Read the following instructions carefully.

1. This question paper contains 85 objective type questions. Q.1 to Q.20 carry **one** mark each and Q.21 to Q.85 carry **two** marks each.

2. Attempt all the questions.

3. Questions must be answered on **Objective Response Sheet (ORS)** by darkening the appropriate bubble (marked A, B, C, D) using HB pencil against the question number on the left hand side of the **ORS. Each question has only one correct answer.** In case you wish to change an answer, erase the old answer completely.

4. Wrong answers will carry NEGATIVE marks. In Q.1 to Q.20, **0.25** mark will be deducted for each wrong answer. In Q.21 to Q.76, Q.78, Q.80, Q.82 and in Q.84, **0.5** mark will be deducted for each wrong answer. However, there is no negative marking in Q.77, Q.79, Q.81, Q.83 and in Q.85. More than one answer bubbled against a question will be taken as an incorrect response. Unattempted questions will not carry any marks.

5. Write your registration number, your name and name of the examination centre at the specified locations on the right half of the **ORS**.

6. Using HB pencil, darken the appropriate bubble under each digit of your registration number and the letters corresponding to your paper code.

7. Calculator is allowed in the examination hall.

8. Charts, graph sheets or tables are NOT allowed in the examination hall.

9. Rough work can be done on the question paper itself. Additionally blank pages are given at the end of the question paper for rough work.

10. This question paper contains **24** printed pages including pages for rough work. Please check all pages and report, if there is any discrepancy.

Q.1 The eigen values of the matrix $\begin{bmatrix} -3 & 2 \\ 1 & -2 \end{bmatrix}$ are $\lambda_1 = -1$ and $\lambda_2 = -4$. An eigen vector of the given matrix is

(A) $\begin{bmatrix} 2 \\ 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ (D) $\begin{bmatrix} -2 \\ -1 \end{bmatrix}$

Q.2 A function $g(t)$ is defined as follows

$$g(t) = \begin{cases} \dfrac{1}{2\tau}, & \text{when } t_0 - \tau < t < t_0 + \tau \\ 0, & \text{when } t \leq t_0 - \tau \text{ and } t \geq t_0 + \tau \end{cases}$$

The Laplace transform of the function $g(t)$ is given by

(A) $\dfrac{1}{2s}[\exp(s\tau) - \exp(-s\tau)]\exp(-st_0)$

(B) $\dfrac{1}{2s}[\exp(s\tau) + \exp(-s\tau)]\exp(-st_0)$

(C) $\dfrac{1}{2s\tau}[\exp(s\tau) - \exp(-s\tau)]\exp(-st_0)$

(D) $\dfrac{1}{2s\tau}[\exp(s\tau) + \exp(-s\tau)]\exp(-st_0)$

Q.3 A worker attends to 1000 spindles in a spinning mill. If the probability of yarn breakage on each spindle, during a time interval t, is 0.005; then, the most probable number of breaks during this interval is

(A) 5   (B) 6   (C) 7   (D) 8

Q.4 If $f(x,y,z) = 4(x^2 + y^2) - z^2$, then ∇f at a point $(1,0,2)$ is given by

(A) $8\,\mathbf{i} - 4\,\mathbf{j}$ (B) $8\,\mathbf{i} - 4\,\mathbf{k}$ (C) $8\,\mathbf{j} - 4\,\mathbf{k}$ (D) $8\,\mathbf{k} - 4\,\mathbf{i}$

Q.5 Given a vector $u(x,y,z) = xy\,\mathbf{i} + (z+x)\,\mathbf{j} + y\,\mathbf{k}$, the points where the $\nabla \times u$ vanishes lie on the plane

(A) $y = 2$
(B) $y = 1$
(C) $z = 1$
(D) $x = 1$

Q.6   The process of drawing of as-spun filaments to impart orientation is typically carried out at temperatures

(A) Just above glass transition (Tg)   (B) Near melting point (Tm)
(C) Below Tg   (D) Near softening point

Q.7   The increase in strength of cotton fibres as a result of increase in moisture regain is due to

(A) Decrease in hydrogen bonds   (B) Increase in crystallinity
(C) Increase in orientation   (D) Increase in both crystallinity and orientation

Q.8   Poly-condensation reaction typically occurs due to the presence of

(A) One functional group   (B) Two functional groups
(C) Low temperature   (D) Addition of a compound

Q.9   On a carding machine

(A)   Doffer wire point height is more than that of cylinder
(B)   Doffer wire point height is less than that of cylinder
(C)   Doffer and cylinder wire point heights are the same
(D)   Doffer and taker-in wire point heights are the same

Q.10   Six slivers are doubled together and given three passages on drawframe. The number of doublings is

(A) 9   (B) 18   (C) 216   (D) 486

Q.11   Out of the following, the technology that produces S & Z twists in the same yarn is

(A) Rotor spinning
(B) Ring spinning
(C) Wrap spinning
(D) Self twist spinning

Q.12   Yarn tension during unwinding from a cop is

(A) High at full cop and low at empty cop
(B) Constant irrespective of stage of unwinding
(C) Low at full cop and high at empty cop
(D) Highest at the beginning, decreases gradually and rises again

Q.13   With an increase in the sizing machine speed, size add-on would

(A) Increase   (B) Decrease
(C) Remain constant   (D) Increase initially and then decrease

Q.14   The stress on warp yarn in a rapier weaving machine is NOT caused by

(A) Initial set up stress
(B) Shed formation
(C) Reed beat-up
(D) Weight of rapier head

Q.15   Bleaching of cotton fabrics is commercially done using

(A)   Sodium Bisulphite   (B)   Sodium Chlorate
(C)   Sodium Chlorite   (D)   Sodium Chloride

Q.16   The typical enzyme/s used for desizing is/are

(A) Peptidase   (B) Cellulase
(C) Mixture of Peptidase and Cellulase   (D) Amylase

Q.17   The direct dyes, under the conditions of dyeing, are

(A) Cationic   (B) Anionic   (C) Nonionic   (C) Amphoteric

Q.18   Bursting strength is normally expressed in

(A) N   (B) N.m   (C) N. m^2 (D) Pa

Q.19   If d is the diameter of a fibre, its flexural rigidity is proportional to

(A) d   (B) d^2 (C) d^3 (D) d^4

Q.20   Uniformity ratio (%) of cotton is in the range of

(A) 40-50   (B) 60-70   (C) 80-90   (D) 90-100

Q. 21 to Q. 75 carry two marks each.

Q.21
If $y_n = \dfrac{d^n y}{dx^n}$ and $y = (x^2 - 1)^n$, then the expression $(x^2 - 1)\, y_{n+2} + 2 \times y_{n+1}$

is equal to

(A) $(n^2 + 1)\, y_n$ (B) $(n^2 - 1)\, y_n$ (C) $n(n-1)\, y_n$ (D) $n(n+1)\, y_n$

Q.22   A function $f(x)$ is defined by

$$f(x) = \begin{cases} -x, & \text{for } -2 \le x < 0 \\ x, & \text{for } \ \ 0 \le x < 2 \end{cases} \qquad \text{and} \quad f(x+4) = f(x).$$

This periodic function $f(x)$ with a period 4 has its Fourier series expansion as

$$f(x) = \frac{a_0}{2} + \sum_{m=1}^{\infty} a_m \cos\frac{m\pi x}{2}, \qquad a_m = \frac{1}{2} \int_{-2}^{2} f(x) \cos\frac{m\pi x}{2} \, dx$$

The coefficient of the term $\cos\dfrac{5\pi x}{2}$ in the above expansion is

(A) -1 (B) $-\dfrac{8}{5\pi}$ (C) $-\dfrac{8}{(5\pi)^2}$ (D) $-\dfrac{8}{(5\pi)^3}$

Q.23   Using $\exp(-x^2)$ as an integrating factor, the solution of the first order differential equation

$$y' - 2xy = 1$$

in terms of the error function $[erf(x)]$ and a constant of integration c, is given by

(A) $y = [c - \dfrac{\sqrt{\pi}}{2} erf(x)] \exp(-x^2)$

(B) $y = [\dfrac{\sqrt{\pi}}{2} erf(x) + c] \exp(-x^2)$

(C) $y = [\dfrac{\sqrt{\pi}}{2} erf(x) + c] \exp(x^2)$

(D) $y = [c - \dfrac{\sqrt{\pi}}{2} erf(x)] \exp(x^2)$

Q.24   Given the second order differential equation

$$x^2 y'' + 2xy' - 6y = 0$$

which of the following constitutes its general solution

(A) $y = c_1 x^{-3} + c_2 x^2$
(B) $y = c_1 x^3 + c_2 x^{-2}$
(C) $y = c_1 \exp(3x) + c_2 \exp(-2x)$
(D) $y = [c_1 + c_2 x] \exp(2x)$

Q.25 The general solution of the third order ordinary differential equation

$$y''' - 3y' + 2y = 0$$

is given by

(A) $y = c_1 + c_2 \exp(-x) + c_3 \exp(2x)$
(B) $y = [c_1 + c_2 x]\exp(-x) + c_3 \exp(2x)$
(C) $y = c_1 + c_2 \exp(x) + c_3 \exp(-2x)$
(D) $y = [c_1 + c_2 x]\exp(x) + c_3 \exp(-2x)$

Q.26 By applying the method of separation of variables $[u(x,t) = X(x)T(t)]$ to the heat equation

$$\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$$

and assuming $-k^2$ as the separation constant, its solution is obtained as

(A) $u(x,t) = [c_1 \sin(kt) + c_2 \cos(kt)]\exp(-k^2 c^2 x)$
(B) $u(x,t) = [c_1 \sinh(kt) + c_2 \cos h(kt)]\exp(-k^2 c^2 x)$
(C) $u(x,t) = [c_1 \sin(kx) + c_2 \cos(kx)]\exp(-k^2 c^2 t)$
(D) $u(x,t) = [c_1 \sinh(kx) + c_2 \cos h(kx)]\exp(-k^2 c^2 t)$

Q.27 The following table gives the values of a function $f(x)$ at points x_j in an interval $[0,1]$, where j represents the index of the point in the given interval

j	x_j	$f(x_j)$
1	0.0	1.000
2	0.1	0.990
3	0.2	0.961
4	0.3	0.914
5	0.4	0.852
6	0.5	0.779
7	0.6	0.698
8	0.7	0.613
9	0.8	0.527
10	0.9	0.445
11	1.0	0.368

The value of the integral $\int_0^1 f(x)\,dx$ using the Simpson's rule is

(A) 0.5469   (B) 0.6469   (C) 0.7469   (D) 0.8469

Q.28 For the following system of equations

$$4x_1 + x_2 + x_3 = 4$$
$$x_1 + 4x_2 - 2x_3 = 4$$
$$3x_1 + 2x_2 - 4x_3 = 6$$

which of the following is the solution, obtained after TWO iterations using Jacobi method

(A) $x_1 = 1.0, \ x_2 = 1.0, \ x_3 = 0.0$
(B) $x_1 = 1.0, \ x_2 = 1.0, \ x_3 = -1.5$
(C) $x_1 = 1.06, \ x_2 = 0.594, \ x_3 = -0.656$
(D) $x_1 = 1.125, \ x_2 = 0.0, \ x_3 = -0.25$

Q.29 A roll of fabric contains on an average 8 defects scattered randomly over $100 \ m^2$ Pieces of fabric of dimension 5m x 2m are cut from this roll. The probability that 5 pieces selected at random are free from defects is

(A)   0.018   (B)   0.2   (C)   0.449   (D)   0.8

Q.30 Let x be a continuous random variable. If the probability distribution function $f(x)$ of x is given by

$$f(x) = \begin{cases} \dfrac{a}{x^2}, & 150 < x < 250 \\ 0, & \text{elsewhere} \end{cases}$$

The value of the constant a is

(A)   75   (B)   175   (C)   275   (D)   375

Q.31 Nylon 6 polymer is produced from caprolactum. The catalyst used in the process is

(A) Magnesium Acetate   (B) Cobalt Acetate
(C) Acetic acid   (D) Water

Q.32 Match the elements of Group I and Group II and choose the correct answer from amongst A, B, C, and D

	Group I		Group II
P	Polyester fibres	1	Melt spinning
Q	Acrylic fibres	2	Dry spinning
R	Nylon fibres	3	Wet spinning
S	Viscose rayon fibres	4	Xanthation
		5	Drawing
		6	Coagulation

(A) P-4, Q-2, R-1, S-6
(B) P-1, Q-3, R-5, S-4
(C) P-5, Q-6, R-4, S-5
(D) P-6, Q-5, R-2, S-3

Q.33 Choose the INCORRECT statement from the following

(A) Thermal stability of fibres can be measured by thermo-gravimetric analysis
(B) Orientation of crystalline regions can be measured by optical microscopy
(C) Crystallinity of fibres can be measured by differential scanning calorimetery
(D) Crystallinity of fibres can be measured by X-ray diffraction

Q.34 Bulking of the filaments CANNOT be achieved by

(A) False twist texturing process
(B) Non-circular cross-sections of individual filaments
(C) Differential shrinkage of biconstituent yarn
(D) Thermo-mechanical setting under taut conditions

Q.35 With respect to the typical tensile behaviour of polyester multifilament yarns

(A) Increase in the rate of testing leads to increase in initial modulus
(B) Increase in temperature of testing leads to increase in strength
(C) Increase in moisture regain leads to increase in initial modulus
(D) Increase in temperature of testing leads to increase in initial modulus

Q.36 Nylon 6 and nylon 66 filaments can be distinguished by

(A) Melting point test
(C) Optical microscopy
(B) Burning test
(D) Density measurement

Q.37 The main distinguishing features of a hollow circular filament to that of a solid circular filament of the same denier are

(A) Higher bending rigidity and higher surface area
(B) Higher thermal insulation and lower surface area
(C) Lower bending rigidity and higher surface area
(D) Higher moisture regain and higher surface area

Q.38 A polypropylene cord has estimated breaking length of approximately 60 km in air. The estimated breaking length of the cord in water would be

(A) 0 km (B) 60 km (C) 180 km (D) ∞

Q.39 Quenching of textile grade POY polyester multi-filaments in the melt spinning process is typically achieved by

(A) Inflow of air (B) Outflow of air
(C) Cross flow of air (D) Water spray

Q.40 The contraction of a yarn upon twisting is 1.07. The twisted yarn count is 30 tex. If 2 dtex fibres are used to produce the yarn, the number of fibres present in yarn. cross-section is

(A) 140 (B) 145 (C) 150 (D) 160

Q.41 During spinning of a yarn on ring frame, the yarn tension is maximum at

(A) Lappet guide
(B) Maximum balloon radius
(C) Traveller
(D) Front roller nip

Q.42 To produce a soft and flexible yarn, one needs

(A) Fine fibres and high twist
(B) Coarse fibres and high twist
(C) Fine fibres and low twist
(D) Coarse fibres and low twist

Q.43 In the context of staple fibre spinning, choose the correct statement

(A) The flyer rotates faster than the bobbin in a bobbin leading speed frame
(B) The traveller runs at the speed of the spindle in ring frame
(C) The vortex created by jets 1 and 2 rotate in the same direction in air jet spinning
(D) The peel-off point in rotor spinning rotates faster than the rotor

Q.44 Placing a condenser in the drafting zone leads to increase in

(A) Nep generation (B) Fly generation
(C) Yarn hairiness (D) Yarn evenness

Q.45 Out of the following spinning systems, in which case the fibres get decelerated as they travel from feed to yarn formation point

(A) Ring spinning (B) Parafil spinning
(C) Air-jet spinning (D) Friction spinning

Q.46 The waste extraction in blow room, card and comber are 6%, 4% and 16% respectively. The weight of combed sliver (kg) from 1 kg of cotton from bale would be

(A) 0.720   (B) 0.740   (C) 0.758   (D) 0.765

Q.47 Consider the following statements pertaining to irregularity generated in sliver after drafting

    P   The irregularity increases with decrease in draft
    Q   The irregularity increases with increase in short fibre %.
    R   The irregularity increases with increase in distance between roller nips
    S   The irregularity increases with increase in unevenness of feed sliver

Choose the right set of answer from the following
(A) P, Q, R   (B) Q, R, S   (C) P, R, S   (D) P, Q, S

Q.48 Match the statement given in Group I to those in Group II and choose the correct combination from amongst the alternatives A, B, C, and D

	Group I		Group II
P	Increase in short fibre % would	1	increase wrapper fibres in rotor yarn
Q	Increase in non-circularity of fibre cross section would	2	increase yarn bulk
R	Increase in fibre length would	3	increase yarn hairiness
S	Increase in fibre fineness would	4	Increase spinning limit

(A)	(B)	(C)	(D)
P-3	P-2	P-1	P-1
Q-2	Q-1	Q-3	Q-4
R-1	R-3	R-4	R-2
S-4	S-4	S-2	S-1

Q.49 In the context of winding, occurrence of slough off increases with

(A) Increase in winding speed, decrease in cone angle, decrease in chase length, increase in coils per cm
(B) Increase in winding speed, increase in cone angle, decrease in chase length, increase in coils per cm
(C) Decrease in winding speed, decrease in cone angle, increase in chase length, decrease in coils per cm
(D) Increase in winding speed, decrease in cone angle, increase in chase length, decrease in coils per cm

Q.50 In a winding operation if E is clearing efficiency, K is knot factor and n is number of objectionable faults present in the yarn, then total number of clearer breaks occurring on the machine would be

(A) EKn (B) EK/n (C) En/K (D) En^2K

Q.51   Consider the elements in Group I and Group II and choose the correct alternatives from amongst A, B, C and D

	Group I		Group II
P	Gabardine	1	Table napery
Q	Leno	2	Tweed
R	Damask	3	Rain coat
S	Huckaback	4	Mosquito net
		5	Towel
		6	Cheese cloth

(A)   P-4,   Q-6,   R-5,   S-3
(B)   P-3,   Q-4,   R-1,   S-5
(C)   P-5,   Q-4,   R-2,   S-1
(D)   P-3,   Q-6,   R-4,   S-1

Q.52   Sizing of a spun yarn normally does not

(A) Increase yarn strength
(B) Reduce yarn hairiness
(C) Increase yarn extension
(D) Improves weavability

Q.53   Consider the following statements in the context of a plain weft knitted structure and choose the INCORRECT statement

(A) With increase in loop length areal density decreases
(B) With increase in loop length fabric width increases
(C) With increase in loop length fabric length increases
(D) With increase in loop length tightness factor increases

Q.54   Consider the following columns and choose the correct combination from amongst the alternatives A, B, C and D

	Group I		Group II
P	Wet laid	1	Coarse fibre
Q	Spun lace	2	Hollow fibre
R	Spun bonded	3	Short fibre
S	Needle punched	4	Thermoplastic fibre
		5	Very flexible fibre
		6	Natural fibre

(A)   P-2,   Q-6,   R-4,   S-3
(B)   P-3,   Q-5,   R-4,   S-1
(C)   P-4,   Q-3,   R-2,   S-3
(D)   P-5,   Q-3,   R-6,   S-2

Q.55 An increase in size add-on

(A) Consistently increases weavability
(B) Consistently decreases weavability
(C) Increases weavability up to a certain limit then decreases
(D) Does not change weavability

Q.56 Loom shed efficiency due to warp stop increases in the case of

(A) Wider loom   (B) Uneven warp
(C) Heavy sett   (D) Less hairy warp

Q.57 What will be the approximate crimp percentage for a square fabric if thread spacing is equal to the sum of the diameters of warp and weft threads?

(A) 4.3   (B) 10.3   (C) 14.3   (D) 18.3

Q.58 Match elements in Group I and Group II and choose the correct answer from amongst the alternatives A, B, C, and D

	Group I		Group II
P	Optical brightening agent	1	Stilbene based compound
Q	Reducing agent	2	Cationic compound
R	Oxidizing agent	3	Sodium bisulfite
S	Dye Fixing agent	4	Sodium hypochlorite
		5	Sodium hydrosulfite
		6	Hydrogen peroxide

(A)   P-1,   Q-3,   R-4,   S-2   (B)   P-6,   Q-3,   R-4,   S-1
(C)   P-2,   Q-3,   R-4,   S-5   (D)   P-1,   Q-6,   R-4,   S-2

Q.59 Wool scouring is normally done

(A) In fibre form
(B) In organic solvent
(C) At boil in the presence of caustic soda
(D) In fabric form

Q.60 The dye bath of solubilized vat dyes has

(A) Alkaline pH   (B) Neutral pH
(C) Alkali and reducing agent   (D) A reducing agent

Q.61 Sodium hydrosulphite is not recommended for discharge printing because

(A) Discharge printing requires high reduction potential
(B) It reacts with the print paste
(C) It needs temperature in excess of 150^0 C to be effective
(D) For discharge printing one needs more hydrolytically stable agent than this

Q.62   Ice colours are

(A) Suitable for garments meant for Antarctica
(B) Azoic colours
(C) Triphenyl methane based dyes
(D) Liquid crystalline colours which develop characteristic colour at temperatures
below zero

> **Questions 63 and 64 are Assertion—reason based questions**

Determine the correctness or otherwise of the following **Assertion [a]** and the
Reason [r]

Q.63   **Assertion:** For producing denims, indigo dyeing is carried out on yarns and not on
fabrics
Reason: This helps to make twill denims using undyed weft to obtain predominantly
blue face and white back so that undergarments are not stained during use

(A) [a] is wrong, [r] is correct   (B) [a] is correct, [r] is wrong
(C) [a] is wrong, [r] is wrong   (D) [a] is correct, [r] is correct

Q.64   **Assertion:** Citric acid does not produce crosslinks on cotton while butane tetra
carboxylic acid (BTCA) does
Reason: It is because citric acid is a tricarboxylic acid and can't produce two
anhydride groups which are essential for producing crosslinks

(A) [a] is wrong, [r] is correct   (B) [a] is correct, [r] is wrong
(C) [a] is wrong, [r] is wrong   (D) [a] is correct, [r] is correct

Q.65   On a drape meter, the area of projected image of draped fabric of 30 cm diameter
kept on an anvil of 18 cm diameter was measured as 362 cm^2. The drape coefficient
of the fabric is approximately

(A) 0.6   (B) 0.7   (C) 0.8   (D) 0.9

Q.66   A yarn specimen of 200 mm extends by 10% when loaded with 500 cN force. The
length of the specimen after removal of load was found to be 202 mm. Percentage
elastic recovery of yarn is

(A) 30   (B) 50   (C) 70   (D) 90

Q.67   With 500 mm specimen length, strain rate (% per min) on a tensile tester with 5m/min
jaw speed would be

(A) 500   (B) 1000   (C) 5000   (D) 10000

Q.68 On a classimat, as compared to the yarn fault B2, the fault D3 is

(A) Thinner and longer   (B) Thicker and longer
(C) Thinner and shorter   (D) Thicker and shorter

Q.69 Eight ends of slivers, each having a CV of 6%, are doubled and drawn to produce the resultant sliver of same hank. If the drawframe introduces 2.12% CV, the CV% of resultant sliver would be approximately

(A) 3   (B) 6   (C) 9   (D) 12

Q.70 Moisture regain of wool, silk and viscose at 65% RH are 17%, 11% and 11% respectively. Weight of water in 100g of fabric at 65% RH having 50% wool, 25% silk and 25% viscose would be approximately

(A) 6.66 g   (B) 9.99 g   (C) 12.22 g   (D) 15.55 g

Common Data Questions

Common Data for Questions 71,72,73

Five grams of 1.5 denier polyester fibre of density 1.39 g/cm^3 is packed in a cylinder of 30 mm diameter with perforated ends to make a fibre plug of 20 mm length.

Q.71 Percentage porosity of the plug would be approximately

(A) 25   (B) 50   (C) 75   (D) 100

Q.72 If 1.2 denier fibre is tested in place of 1.5 denier fibre, the percentage change in the flow rate would be

(A) 20   (B) 30   (C) 40   (D) 50

Q.73 Change in the total length of fibre in meters packed in the plug, when 1.5 denier fibre is replaced with 1.2 denier fibre, would be

(A) 5000   (B) 7500   (C) 10000   (D) 12500

Common Data for Questions 74, 75

A durable press cotton fabric has 6% add-on of DMDHEU. Assume that the molecular weight of anhydro glucose unit (agu) and the reaction efficiency (%) are 162 and 100 respectively

Q.74 The nitrogen add-on (%) is approximately

(A) 0.88   (B) 1.18   (C) 1.38   (D) 1.58

Q.75 The number of crosslinks per agu is approximately

(A) 0.007   (B) 0.07   (C) 0.7   (D) 7.0

Statement for Linked Answer Questions 76 & 77

Given the length of crystalline region as 90 $\overset{\circ}{A}$, crystalline density of polyester as 1.445 g/cc and amorphous density as 1.335 g/cc.

Q.76   If the density of polyester fibres is 1.399 g/cc, the fractional density crystallinity of polyester would be approximately

    (A) 0.54   (B) 0.57   (C) 0.60   (D) 0.63

Q.77   Assuming a linear two phase model of crystalline and amorphous regions for these fibres, the amorphous length would be

    (A) 50 $\overset{\circ}{A}$ (B) 60 $\overset{\circ}{A}$ (C) 70 $\overset{\circ}{A}$ (D) 80 $\overset{\circ}{A}$

Statement for Linked Answer Questions 78 & 79

A 46 mm diameter rotor is spinning 60 tex yarn at 100 m/min. The trash level in feed sliver is 0.2%. The opening roller can clean the sliver to the extent of 70%. The self cleaning effect of the yarn arm within the rotor is 50%

Q.78   Trash deposition (mg/cm of rotor circumference) after 1 min will be

    (A) 0.1245   (B) 0.1320   (C) 0.1420   (D) 0.1485

Q.79   If an interruption in spinning is expected once the deposition attains 0.2 mg/cm in the rotor groove, number of end breaks expected in 8 hours is

    (A) 260   (B) 290
    (C) 299   (D) 312

Statement for Linked Answer Questions 80 & 81

In a jacquard harness system, the vertical distance between the bottom end of the central hook and the comber board is 140 cm

Q.80   The length of the harness cord (cm) controlling an end, operated by the same hook at a distance of 75 cm from the centre of the machine, would be approximately

    (A) 65.8   (B) 158.8   (C) 215.8   (D) 315.8

Q.81   If the required shed depth of this machine is 7 cm, the percentage loss in shed depth at the same side harness operated by the same hook would be approximately

    (A) 13.3   (B) 12.3   (C) 11.3   (D) 10.3

Statement for Linked Answer Questions 82 & 83

A cotton fabric (110 GSM, 1 m wide) is to be dyed by pad-dry-bake sequence (wet expression 100%) on a machine running at 50 m/min. The volume of the padding liquor (V; ℓ) is kept constant by continuous replenishing

Q.82 If the dye is being picked at a rate 1.2 times the rate when there is no tailing effect, the concentration (g/ℓ) of the dye bath at equilibrium would be approximately (assume that the concentration of replenishing liquor is the same as that of the initial concentration (Co; g/ℓ) of the dye bath)

(A) 1.25Co (B) 0.83Co (C) 0.62Co (D) 0.54Co

Q.83 If the dye bath concentration is to be kept constant at the original level Co, the concentration (g/ℓ) of the replenishing liquor would be

(A) 2.0Co (B) 1.6Co (C) 1.2Co (D) 0.8Co

Statement for Linked Answer Questions 84 & 85

36 Ne cotton yarn is used to produce a square fabric of 101 g/m^2 ,having 10% yarn crimp

Q.84 Number of threads per cm in the fabric is approximately

(A) 14 (B) 28 (C) 42 (D) 56

Q.85 Percentage of area covered by yarn in the fabric is approximately

(A) 50 (B) 65 (C) 80 (D) 95

END OF THE QUESTION PAPER