Q. 1 – Q. 25 carry one mark each.

Q.1   If 3 and 4 are two eigen values of $A = \begin{bmatrix} 3 & a & b \\ c & 2 & d \\ e & f & 4 \end{bmatrix}$ for some real numbers $a, b, c, d, e,$ and $f,$ then

the third eigen value of A is _____

Q.2   If a continuous random variable X has probability density function

$f(x) = \begin{cases} ax^2, & 0 \le x \le 1 \\ 0, & otherwise \end{cases}$

then the value of a is _____

Q.3   The value of $\lim_{x \to 0} \dfrac{\sin x}{x}$ is _____

Q.4   If $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & \dfrac{1}{12} \end{bmatrix}$, then determinant of A^{-1} is _____

Q.5   The number of linearly independent eigen vectors of the matrix $\begin{bmatrix} 1 & 0 \\ 3 & 4 \end{bmatrix}$ is _____

Q.6   The gum in the raw silk filament is

(A) Wax   (B) Lignin   (C) Sericin   (D) Fibroin

Q.7   For production of dry-spun acrylic fibre, the suitable solvent for dope preparation is

(A) Acetone
(B) *N,N'* Dimethyl formamide
(C) Formic acid
(D) Aqueous sodium thiocyanate (55 wt%)

Q.8   Adipic acid is a monomer for the production of

(A) Poly(ethylene terephthalate)
(B) Nylon 66
(C) Nylon 64
(D) Nylon 610

Q.9   In melt spinning line, the melting of solid polymer and its homogenization takes place in

(A) Manifold
(B) Extruder
(C) Metering pump
(D) Quench duct

Q.10   The blending technique that gives the most homogeneous mixing of fibres is

(A) Lap blending   (B) Tuft blending   (C) Sliver blending   (D) Roving blending

Q.11   In a cotton comber, noil extraction increases

(A) With a decrease in detachment setting
(B) With an increase in pre-combing draft
(C) If majority of hooks are presented in leading direction
(D) With an increase in short fibres

Q.12   The bottom roller surface used for driving aprons in ringframe drafting system is

(A) Knurled
(B) Axially fluted
(C) Spirally fluted
(D) Smooth

Q.13   If the numerical value of yarn linear density expressed in Tex and that in English system is the same, this value to the nearest integer is

(A) 30   (B) 28   (C) 24   (D) 22

Q.14   Patterning is most likely to occur in

(A) Precision winding   (B) Random winding
(C) Step-precision winding   (D) Pirn winding

Q.15   In cotton yarn sizing, the starch primarily acts as

(A) Binding agent   (B) Lubricating agent   (C) Antistatic agent   (D) Antimicrobial agent

Q.16   Purl is a

(A) Woven structure   (B) Nonwoven structure
(C) Braided structure   (D) Knitted structure

Q.17   The technology/ies used for producing SMS fabric is/are

(A) Spunlace
(B) Spunlace and Meltblown
(C) Needlepunch
(D) Spunbond and Meltblown

Q.18   Jigger **CANNOT** be used for

(A) Dyeing
(B) Printing
(C) Washing
(D) Scouring

Q.19   In the context of effluent discharge, BOD means

(A) Bio-oxidative degradation
(B) Bio oxygen distress
(C) Biological oxygen demand
(D) Bacteria observed on disc

Q.20   Milling is associated with the processing of

(A) Cotton fabric
(B) Silk fabric
(C) Jute fabric
(D) Wool fabric

Q.21   Dyed wool fabric standards are used for the evaluation of

(A) Wash fastness
(B) Perspiration fastness
(C) Sublimation fastness
(D) Light fastness

Q.22   The yarn tenacity (gf/tex) measured in lea form, compared to that measured in single yarn form is

(A) Always lower
(B) Always higher
(C) Always equal
(D) Higher or lower depending on yarn count

Q.23   The property that Kawabata Evaluation System (KES) **DOES NOT** measure is

(A) Shear rigidity
(B) Bending rigidity
(C) Compressional resilience
(D) Tensile strength

Q.24   On absorption of moisture, the thermal insulation of cotton fabric will

(A) Decrease
(B) Increase
(C) Remain the same
(D) First increase and then decrease

Q.25   For meeting the criterion of number of defects in a product, the relationship between upper control limit (UCL) and upper specification limit (USL) should be

(A) UCL < USL
(B) UCL > USL
(C) UCL = 2USL
(D) UCL = (USL)^3

Q. 26 – Q. 55 carry two marks each.

Q.26   The maximum value of $f(x) = \sqrt{2}(\sin x + \cos x)$ for x in $[0, \pi]$ is _____

Q.27   Out of the following, the exact differential equation is

(A) $-ydx + xdy = 0$ (B) $ydx + xdy = 0$ (C) $ydx - xdy = 0$ (D) $dx + xdy = 0$

Q.28   Let $f : [1,4] \to \Re$ be a continuous function such that $f(1) = 0.32$, $f(2) = 0.125$, $f(3) = 0.025$ and $f(4) = 0.05$. The value of the integral $\int_{1}^{4} f(x)dx$, accurate up to three decimal places, obtained by Trapezoidal rule with n=3 is _____

Q.29 The normal vector to the surface $z = \sqrt{x^2 + y^2}$ at (1,1,1) is

(A) $\hat{i} + \hat{j} + \hat{k}$ (B) $\hat{i} - \hat{j} + \hat{k}$ (C) $-\hat{i} - \hat{j} + \hat{k}$ (D) $-\hat{i} + \hat{j} + \hat{k}$

Q.30 Consider the analytical techniques in the **Column I** and the properties in **Column II.** Choose the correct alternative from amongst A, B, C, and D

Column I		**Column II**	
P	FTIR	1	Orientation
Q	Differential scanning calorimetry	2	Functional groups
R	Density	3	Crystallinity
S	Birefringence	4	Crystallization temperature

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

Q.31 If T_g, T_m, and T_c represent the glass transition, melting and crystallization temperature, respectively, the correct relationship is

(A) $T_g < T_c < T_m$
(B) $T_g < T_m < T_c$
(C) $T_c < T_g < T_m$
(D) $T_m < T_g < T_c$

Q.32 The correct sequence of unit operations employed in production of viscose rayon is

(A) Ageing - Steeping - Xanthation - Ripening
(B) Ageing - Steeping - Ripening - Xanthation
(C) Steeping - Ageing - Ripening - Xanthation
(D) Steeping - Ageing - Xanthation - Ripening

Q.33 Consider the following assertion **[a]** and reason **[r]** and choose the correct alternative from amongst A, B, C, and D.

[a] After polymerization of caprolactum, thorough washing of polymer with water is necessary to remove unreacted monomer and its oligomers.
[r] Otherwise, hydrolytic degradation of polymer would occur during melt spinning.

(A) **[a]** is right and **[r]** is wrong
(B) **[a]** is right and **[r]** is right
(C) **[a]** is wrong and **[r]** is wrong
(D) **[a]** is wrong and **[r]** is right

Q.34   Consider the fibres in **Column I** and the applications in **Column II.** Choose the correct alternative from amongst A, B, C, and D

Column I	**Column II**
P Acrylic	1 Chemical filtration
Q Jute	2 Tire cord
R Nylon	3 Precursor for carbon fibre
S Polypropylene	4 Biodegradable sacks

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

Q.35   Two polyester and six viscose rayon slivers of same count are blended on a drawframe. In the second passage, four slivers from first passage are further blended with two combed cotton slivers of the same count. The viscose (%) in the final sliver to the nearest integer is _____

Q.36   In ring spinning, the tension in yarn is the maximum

(A) Between the lappet guide and front roller
(B) Where the balloon radius is the maximum
(C) In winding zone
(D) Just below the lappet guide

Q.37   A core spun yarn of 30 tex is to be produced with 10% core by weight. If the cotton roving count is 540 tex, the required draft on the ringframe will be _____

Q.38   If the spindle speed of ringframe is 15000 rpm and the traveler speed at the maximum bobbin diameter of 50 mm is 0.8% less than that of the spindle. The yarn delivery rate (m/min), to the nearest integer, will be _____

Q.39   A rotor of 2 inch diameter is spinning a yarn of 16^s Ne. If the twist multiplier is 5 and the fibre linear density is 0.1 tex, the average fibre flow through the transport channel, to the nearest integer, will be _____

Q.40   The groove drum in a random winder makes five revolutions for one double traverse. If the drum and package diameters are 10 cm and 5 cm, respectively, the wind per double traverse would be_____

Q.41   A 500-end double-lift, single-cylinder jacquard has

(A) 500 hooks and 500 needles
(B) 500 hooks and 1000 needles
(C) 1000 hooks and 500 needles
(D) 1000 hooks and 1000 needles

Q.42   A shuttle loom is running at 240 picks per minute. The angular velocity of bottom shaft in radian per second is $n\pi$. The value of n is _____

Q.43   In an air-jet loom, if the weft yarn diameter is increased by 10%, keeping the linear density constant, the percent increase in the drag force would be _____

Q.44   For a fully relaxed knitted fabric, the wale constant (K_w) and course constant (K_c) are 4.2 and 5.5, respectively. If the loop length is 0.5 cm, the loop density per cm^2, to the nearest integer, would be _____

Q.45   Consider the following assertion **[a]** and reason **[r]** and choose the correct alternative from amongst A, B, C, and D.

[a] Cross-laid needlepunched nonwoven fabrics demonstrate higher tensile strength in machine direction.
[r] In cross-laid nonwoven fabrics, the fibres are randomly oriented.

(A) **[a]** is right and **[r]** is wrong
(B) **[a]** is right and **[r]** is right
(C) **[a]** is wrong and **[r]** is wrong
(D) **[a]** is wrong and **[r]** is right

Q.46   If **[C$_s$]** and [**C$_f$**] represent dye concentration in the bath and in the fibre, respectively, the isotherm for dyeing of polyester with disperse dyes is represented by the figure
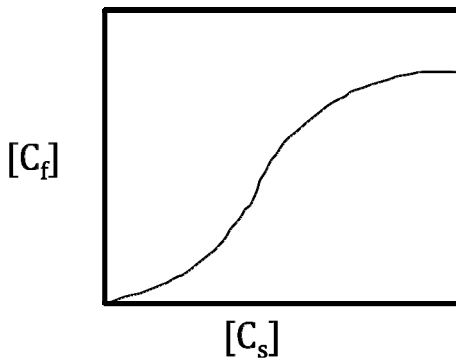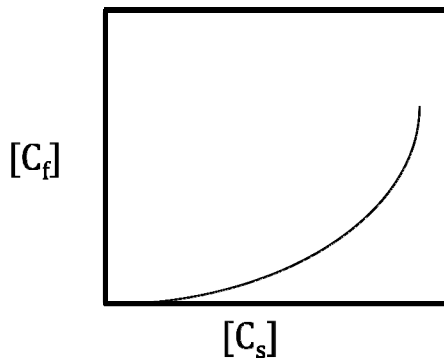
(A)

$[C_f]$ $[C_s]$

(B)

$[C_f]$ $[C_s]$
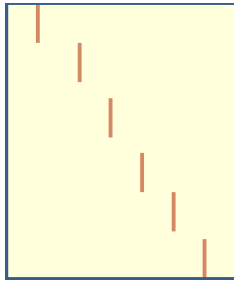
(C)

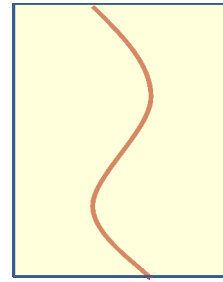$[C_f]$ $[C_s]$

(D)

$[C_f]$ $[C_s]$
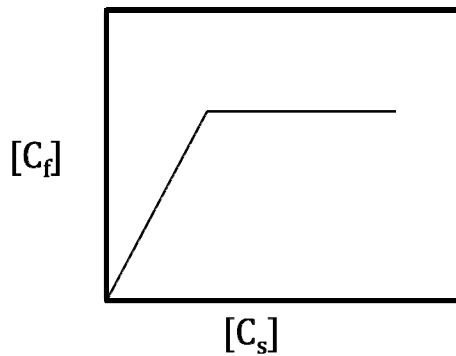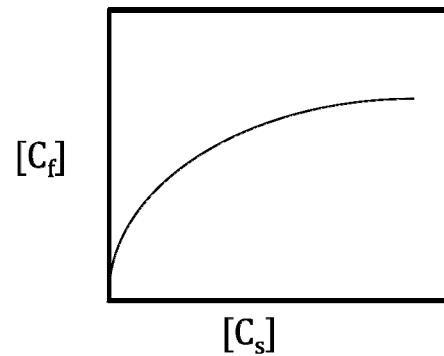
Q.47 A small hard particle is stuck in the doctor blade of a roller printing machine. The printing fault on the fabric, as a result of this, is represented by the figure
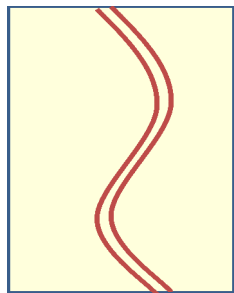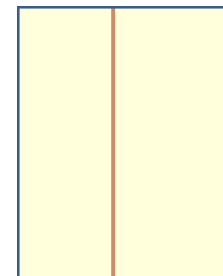
(A)   (B)

(C)   (D)

Q.48 Consider the following assertion **[a**] and reason **[r]** and choose the correct alternative from amongst A, B, C, and D.

[a] Millions of shades can be produced through ink-jet printing with only four basic colours.
[r] The colours get mixed in appropriate proportions before jetting onto the fabric.

(A) **[a]** is right and **[r]** is wrong
(B) **[a]** is right and **[r]** is right
(C) **[a]** is wrong and **[r]** is wrong
(D) **[a]** is wrong and **[r]** is right

Q.49 Consider the following assertion **[a**] and reason **[r]** and choose the correct alternative from amongst A, B, C, and D.

[a] Fluorochemicals impart very high water repellency.
[r] Fluorochemicals significantly reduce the surface energy of the treated substrate.

(A) **[a]** is right and **[r]** is wrong
(B) **[a]** is right and **[r]** is right
(C) **[a]** is wrong and **[r]** is wrong
(D) **[a]** is wrong and **[r]** is right

Q.50   Consider the following assertion **[a]** and reason **[r]** and choose the correct alternative from amongst A, B, C, and D.

[a] In the context of foam finishing, the narrow size distribution of foam cells increases the half life of foam.
[r] The rate of coalescing and collapsing of foam cells is low in this case.

(A) **[a]** is right and **[r]** is wrong
(B) **[a]** is right and **[r]** is right
(C) **[a]** is wrong and **[r]** is wrong
(D) **[a]** is wrong and **[r]** is right

Q.51   For a typical yarn tensile test, force (F) in Newton and elongation (e) in cm are related as under

$F = 2 + 4\,e + 3\,e^2$

If the yarn fails at an elongation of 3 cm, the work of rupture in N-m, accurate up to first decimal place is_____

Q.52   Choose the **INCORRECT** statement from amongst the A, B, C, and D

(A) Crease recovery is higher for thick and dense fabric
(B) Tear strength of fabric improves with greater float length
(C) Strength CV of yarn does not affect the weaveability
(D) Higher drape coefficient indicates stiffer fabric

Q.53   The unique ability of woven fabric to drape in multiple curvatures is mainly due to

(A) High tensile modulus
(B) Low shear rigidity
(C) Low compressibility
(D) High bending rigidity

Q.54   The relationship between 50% span length of fibre (L_1) and 2.5% span length of fibre (L_2) for a given cotton variety is given by

$$L_1 = \frac{L_2}{2} + 5$$

If standard deviation (SD) of L_2 is 4 mm, that of the L_1 , in mm, would be_____

Q.55   The correlation coefficient (r) between two variables is 0.9. The unexplained variation (%) is _____

END OF THE QUESTION PAPER