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TF: TEXTILE ENGINEERING AND FIBRE SCIENCE

Duration: Three Hours *Maximum Marks*: 100

Please read the following instructions carefully:

General Instructions:

1. Total duration of examination is 180 minutes (3 hours).
2. The clock will be set at the server. The countdown timer in the top right corner of screen will display the remaining time available for you to complete the examination. When the timer reaches zero, the examination will end by itself. You will not be required to end or submit your examination.
3. The Question Palette displayed on the right side of screen will show the status of each question using one of the following symbols:

You have not visited the question yet.

You have not answered the question.

You have answered the question.

You have NOT answered the question, but have marked the question for review.

You have answered the question, but marked it for review.

The Marked for Review status for a question simply indicates that you would like to look at that question again. ***If a question is answered and Marked for Review, your answer for that question will be considered in the evaluation.***

Navigating to a Question

4. To answer a question, do the following:
   a. Click on the question number in the Question Palette to go to that question directly.
   b. Select an answer for a multiple choice type question. Use the virtual numeric keypad to enter a number as answer for a numerical type question.
   c. Click on **Save and Next** to save your answer for the current question and then go to the next question.
   d. Click on **Mark for Review and Next** to save your answer for the current question, mark it for review, and then go to the next question.
   e. Caution: Note that your answer for the current question will not be saved, if you navigate to another question directly by clicking on its question number.
5. You can view all the questions by clicking on the **Question Paper** button. Note that the options for multiple choice type questions will not be shown.

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Answering a Question

6. Procedure for answering a multiple choice type question:
    a. To select your answer, click on the button of one of the options
    b. To deselect your chosen answer, click on the button of the chosen option again or click on the **Clear Response** button
    c. To change your chosen answer, click on the button of another option
    d. To save your answer, you MUST click on the **Save and Next** button
    e. To mark the question for review, click on the **Mark for Review and Next** button**.** ***If an answer is selected for a question that is Marked for Review, that answer will be considered in the evaluation.***

7. Procedure for answering a numerical answer type question:
    a. To enter a number as your answer, use the virtual numerical keypad
    b. A fraction (eg.,-0.3 or -.3) can be entered as an answer with or without '0' before the decimal point
    c. To clear your answer, click on the **Clear Response** button
    d. To save your answer, you MUST click on the **Save and Next** button
    e. To mark the question for review, click on the **Mark for Review and Next** button**.** ***If an answer is entered for a question that is Marked for Review, that answer will be considered in the evaluation.***

8. To change your answer to a question that has already been answered, first select that question for answering and then follow the procedure for answering that type of question.

9. Note that ONLY Questions for which answers are saved or marked for review after answering will be considered for evaluation.

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Paper specific instructions:

1. There are a total of 65 questions carrying 100 marks. Questions are of multiple choice type or numerical answer type. A multiple choice type question will have four choices for the answer with only **one** correct choice. For numerical answer type questions, the answer is a number and no choices will be given**. A number as the answer should be entered** using the virtual keyboard on the monitor.

2. Questions Q.1 – Q.25 carry 1mark each. Questions Q.26 – Q.55 carry 2marks each. The 2marks questions include two pairs of common data questions and two pairs of linked answer questions. The answer to the second question of the linked answer questions depends on the answer to the first question of the pair. If the first question in the linked pair is wrongly answered or is not attempted, then the answer to the second question in the pair will not be evaluated.

3. Questions Q.56 – Q.65 belong to General Aptitude (GA) section and carry a total of 15 marks. Questions Q.56 – Q.60 carry 1mark each, and questions Q.61 – Q.65 carry 2marks each.

4. Questions not attempted will result in zero mark. Wrong answers for multiple choice type questions will result in **NEGATIVE** marks. For all 1 mark questions, ⅓ mark will be deducted for each wrong answer. For all 2 marks questions, ⅔ mark will be deducted for each wrong answer. However, in the case of the linked answer question pair, there will be negative marks only for wrong answer to the first question and no negative marks for wrong answer to the second question. There is no negative marking for questions of numerical answer type.

5. Calculator is allowed. Charts, graph sheets or tables are **NOT** allowed in the examination hall.

6. Do the rough work in the Scribble Pad provided.

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Q. 1 – Q. 25 carry one mark each.

Q.1 The fibre that contains nitrogen and sulfur is

(A) Polyester (B) Wool (C) Nylon 6 (D) Kevlar

Q.2 Condensation polymerization is not used to produce

(A) Polyester (B) Nylon 6 (C) Nylon 66 (D) Polypropylene

Q.3 Wet spinning technique is commercially used to produce filament yarn of

(A) Polypropylene
(B) Polyester
(C) Nylon 66
(D) Acrylic

Q.4 The fibre that dissolves in 59% (w/w) sulfuric acid solution is

(A) Wool
(B) Polypropylene
(C) Cotton
(D) Viscose

Q.5 Surface features of a fibre can be obtained by

(A) Transmission electron microscope
(B) Scanning electron microscope
(C) Small angle X-ray diffractometer
(D) Sonic modulus tester

Q.6 Birefringence of filament yarn is related to its

(A) Crystallinity
(B) Orientation
(C) Individual filament denier
(D) Density

Q.7 A machine that does not improve the mass evenness is

(A) Drawframe (B) Ring doubler
(C) Speedframe (D) Ribbon lap

Q.8 Fibre individualization in a card will increase by increasing

(A) Licker-in to cylinder setting (B) Doffer speed
(C) Licker-in speed (D) Cylinder speed

Q.9 Softer cots on drafting rollers result in

(A) An increase in drafting wave (B) Less fibre slippage at roller nip
(C) Change in draft (D) Reduced roller lapping

Q.10 Compared to the spinning of finer cotton yarns, the preferred rotor diameter for the production of very coarse cotton yarns would

(A) Be higher
(B) Be lower
(C) Remain the same
(D) Change depending on fibre strength

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Q.11 Amongst the following, the suitable technology for producing core spun yarn is

(A) Air vortex spinning (B) Rotor spinning
(C) Friction spinning (D) Air-jet spinning

Q.12 Increase in taper angle on sectional warping drum will normally require

(A) Higher warping speed
(B) Lower warping speed
(C) Increase in traverse speed
(D) Decease in traverse speed

Q.13 Increase in the ratio of the length of crank to the length of connecting rod leads to

(A) Increase in sley eccentricity
(B) Decrease in sley eccentricity
(C) No change in sley eccentricity
(D) Initial increase and then decrease in sley eccentricity

Q.14 Shuttle remains on the race board during its flight in the shed because of

(A) Forward positive acceleration of the sley
(B) Backward positive acceleration of the sley
(C) Constant forward velocity
(D) Constant backward velocity

Q.15 In weft knitted fabrics of the same mass per unit area produced from the same yarns, the structure which will give the highest thickness is

(A) Plain
(B) Rib
(C) Purl
(D) Interlock

Q.16 The nonwoven process which has the highest production rate is

(A) Needle punching (B) Hydroentangling
(C) Melt blowing (D) Spunbonding

Q.17 During bleaching of cotton with H_2O_2, the stabilizer used is

(A) Sodium hydroxide (B) Sodium silicate
(C) Acetic acid (D) Sodium carbonate

Q.18 The highest washing fastness in a dyed cotton fabric would be obtained if the dye-fibre bond is

(A) Ionic (B) Hydrogen
(C) Covalent (D) Van der Waal's force

Q.19 Disperse dye cannot generally be fixed on polyester by

(A) Superheated steam at180^{o}C (B) Saturated steam at 130^{o}C
(C) Dry heat at 200^{o}C (D) Saturated steam at 100^{o}C

Q.20 Crease resist finishing of cotton fabric does not lead to

(A) Reduction in tensile strength (B) Increase in dimensional stability
(C) Increase in moisture regain (D) Increase in bending length

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Q.21 Two yarn samples have standard deviation of strength σ_1 and σ_2. If $\sigma_1 < \sigma_2$, the 'F' ratio would be

(A) σ_1 / σ_2 (B) σ_2 / σ_1 (C) σ_1^2 / σ_2^2 (D) σ_2^2 / σ_1^2

Q.22 Nep count in a cotton fibre sample is measured by

(A) AFIS (B) HVI (C) Uster tester (D) Stelometer

Q.23 In a given woven fabric the extension at break in weft direction is higher than that in warp direction. During bursting strength test, the threads that will always break first are

(A) Warp
(B) Weft
(C) Both warp and weft simultaneously
(D) Those with lower strength

Q.24 CSP of yarn is equal to the product of

(A) Yarn tex and lea strength (N)
(B) Yarn count (Ne) and lea strength (lbf)
(C) Yarn tex and lea strength (lbf)
(D) Yarn count (Ne) and lea strength (kgf)

Questions Q.25 to Q.32 are numerical answer type. The answer to each of these questions is either a positive whole number, or a positive real number with maximum of 2 decimal places.

Q.25 If the moisture regain of a fibre is 10%, its moisture content (%) is _____ .

Q. 26 to Q. 55 carry two marks each.

Q.26 A market survey by a garment manufacturing company revealed that the chest width of their target customers had normal distribution with a mean of 54 cm. If 18% of customers surveyed have chest width greater than 58 cm and 75% of customers surveyed have chest width greater than 52 cm, the percentage of customers having chest width between 56 cm and 58 cm is _____.

Q.27 The relationship between load (y) in N and elongation (x) in mm of a cotton fabric is $y = \sqrt{x}$.
If the breaking elongation of the fabric is 9 mm, the work of rupture, in N.mm, is_____.

Q.28 On twisting, the denier of a multifilament yarn consisting of 300 filaments of 3 denier each becomes 1100. If 11 km of untwisted filament yarn is twisted, its length in km will be _____.

Q.29 A loom is producing 2 m wide grey fabric with 8% weft crimp. Assuming that the loom is running at 570 rpm with 90% efficiency, the weft consumption in kg/hr of 30 tex yarn will be _____.

Q.30 The strength of 100 g/m^2 fabric obtained by testing 4 cm wide strip is 0.4 kN. The tenacity (cN/tex) of the fabric is _____.

Q.31 Out of 100 textile companies, 10 companies are involved in spinning, weaving and chemical processing, 25 companies are involved in spinning and chemical processing, and 30 companies are involved in weaving and chemical processing. If 65 companies are involved in chemical processing, the number of companies involved ONLY in chemical processing is_____.

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Q.32 In a card the probability of fibre transfer from cylinder to doffer in one revolution of cylinder is 0.2. The probability that a particular fibre will be transferred to the doffer within the first three revolutions of cylinder is _____.

Questions Q.33 to Q.55 are multiple choice type.

Q.33 The particular integral of $\frac{d^2y}{dx^2} + 5\frac{dy}{dx} + 6y = e^{2x}$ is

(A) $e^{2x}/_{20}$ (B) $e^{2x}/_{12}$ (C) $2e^{2x}$ (D) $4e^{2x}$

Q.34 The inverse of the matrix $\begin{bmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{bmatrix}$ is

(A) $\begin{bmatrix} sin\theta & cos\theta \\ cos\theta & -sin\theta \end{bmatrix}$

(B) $\begin{bmatrix} cos\theta & sin\theta \\ -sin\theta & cos\theta \end{bmatrix}$

(C) $\begin{bmatrix} -sin\theta & cos\theta \\ cos\theta & sin\theta \end{bmatrix}$

(D) $\begin{bmatrix} cos\theta & -sin\theta \\ sin\theta & cos\theta \end{bmatrix}$

Q.35 Consider the following assertion **[a]** and reason **[r]** and choose the most appropriate answer

[a] Nylon 6 is polymerized using only single monomer caprolactum
[r] Synthesis of Nylon 6 is basically an addition polymerization

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

Q.36 Consider the following assertion **[a]** and reason **[r]** and choose the most appropriate answer

[a] Sodium cellulose xanthate formation is an essential unit operation in the production of viscose rayon
[r] It helps to reduce the degree of polymerization of cellulose

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

Q.37 Consider the following assertion **[a]** and reason **[r]** and choose the most appropriate answer

[a] In false-twist friction texturing, the ratio of input to output tension is kept close to one
[r] Broken filaments and tight spots are within the acceptable limits at this condition

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

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Q.38 Consider the following assertion **[a]** and reason **[r]** and choose the most appropriate answer

[a] Heat setting increases the dimensional stability of synthetic fabrics
[r] The free energy reduces as a result of heating

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

Q.39 The advantage of flyer leading over bobbin leading speed-frame is

(A) Lower roving stretch
(B) Lesser chance of unwinding after breakage
(C) Lower power requirement
(D) Power requirement remains fairly constant during the bobbin build up

Q.40 The daily production of a mill is 1200 kg of 30 tex and 1200 kg of 20 tex yarns. The average yarn tex produced by this mill is

(A) 23 (B) 24 (C) 25 (D) 26

Q.41 A square plain jammed woven fabric of 0.5 mm thickness is to be produced from polyester yarns. Assuming circular yarn cross-section, the number of picks per cm in the fabric on the loom is approximately

(A) 13 (B) 18 (C) 23 (D) 28

Q.42 On a winding machine, if the winding speed is increased from 1000 m/min to 1200 m/min, the percentage increase in the yarn tension will be approximately

(A) 12 (B) 24 (C) 36 (D) 44

Q.43 Choose the correct alternative from amongst A, B, C and D

Mercerization of cotton results in

P Increase in tensile strength
Q Increase in dye uptake
R Modification of crystal structure
S Decrease in moisture regain

(A) P,Q,R (B) Q,R,S
(C) P,S,R (D) P,Q,S

Q.44 In the case of reactive dyeing of cotton, the exhaustion is 70% and reaction efficiency is 80%. Assuming that the initial dye concentration is 2% on the weight of fabric, the amount of unreacted dye on the fabric expressed as a percentage of fabric weight would be

(A) 0.14 (B) 0.28 (C) 0.35 (D) 0.42

Q.45 Consider the following assertion **[a]** and reason **[r]** and choose the most appropriate answer

[a] Controlled reduction treatments are commercially used for shrink resist finishing of wool
[r] Reduction disrupts the disulphide bonds, which are responsible for wool shrinkage

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

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Q.46 The principle which cannot be used to measure hairiness of yarn is

(A) Light scattering
(B) Image analysis
(C) Photoelectric
(D) Capacitance

Q.47 The abrasion cycles on a flat abrasion tester increase with an increase in

(A) Pressure applied during abrasion
(B) Speed of abrasion
(C) Area of abraded surface
(D) Specimen tension during abrasion

Common Data Questions

Common Data for Questions 48 and 49:

A winding machine without anti-patterning device has the following particulars:

Cylindrical winding drum diameter	: 75 mm
Number of crossing on drum	: $2\frac{1}{2}$
Rotational speed of the drum	: 2860 rev/min
Traverse length	: 150 mm

A 3.5 degree constant taper cone is built on the above cone winder with no movement of the point of drive during the package build up. At mean cone diameter of 150 mm the package rev/min is 1375.

Q.48 The number of times major patterning will occur in producing 200 mm mean diameter package on 40 mm mean diameter core is

(A) 5 (B) 7 (C) 9 (D) 11

Q.49 Distance in mm of point of drive from the base of the cone along the traverse is approximately

(A) 26 (B) 30 (C) 36 (D) 40

Common Data for Questions 50 and 51:

Consider the following particulars for a spinning line producing 30 tex yarn from 150 militex polyester fibre.

Mass CV of card sliver	: 3%
Mass CV added at draw-frame	: 2%
Mass CV added at speed-frame	: 3%
Mass CV added at ring-frame	: 7%
Number of doubling at draw-frame	: 6
Number of draw-frame passage	: 1

Q.50 The mass CV% of roving is approximately

(A) 3.4 (B) 3.8 (C) 4.2 (D) 4.6

Q.51 Index of irregularity of yarn is approximately

(A) 0.88 (B) 1.13 (C) 1.33 (D) 1.53

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Linked Answer Questions

Linked Answer Questions 52 and 53:

The angle subtended by the half-lap on the cylinder comb is 90^{o}. The time taken by the half-lap to comb a fringe is 0.04 s.

Q.52 The speed of the comber in nips/min is

(A) 325 (B) 350 (C) 375 (D) 400

Q.53 From the following data, calculate approximate production rate in kg/hr

Length of lap fed per nip	: 6 mm
Lap linear density	: 60 ktex
Noil	: 20%
Efficiency	: 80%
Number of heads	: 6

(A) 21 (B) 26 (C) 31 (D) 36

Linked Answer Questions 54 and 55:

Viscose fabric is to be resin finished with DMDHEU by pad-dry-cure method. Assume that

Mass of fabric per unit area	: 200 g/m^2
Width of fabric	: 100 cm
Speed of the machine	: 50 m/min
Concentration of pad liquor	: 100 g/l
Wet pick up	: 100%
Specific gravity of padding liquor	: 1.0
Molecular weight of anhydroglucose unit	: 162

Q.54 The resin add-on after padding in kg per kg of fabric will be

(A) 0.1 (B) 0.2 (C) 0.3 (D) 0.4

Q.55 Assuming that the reaction takes place in amorphous region only and that the fabric crystallinity is 33%, the number of cross links formed per anhydroglucose unit after curing would be approximately

(A) 0.07 (B) 0.14 (C) 0.28 (D) 0.35

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General Aptitude (GA) Questions

Q. 56 – Q. 60 carry one mark each.

Q.56 A number is as much greater than 75 as it is smaller than 117. The number is:

(A) 91 (B) 93 (C) 89 (D) 96

Q.57 The professor ordered to the students to go out of the class.
I II III IV
Which of the above underlined parts of the sentence is grammatically incorrect?

(A) I (B) II (C) III (D) IV

Q.58 Which of the following options is the closest in meaning to the word given below:

Primeval

(A) Modern
(B) Historic
(C) Primitive
(D) Antique

Q.59 Friendship, no matter how _____it is, has its limitations.

(A) cordial

(B) intimate

(C) secret

(D) pleasant

Q.60 Select the pair that best expresses a relationship similar to that expressed in the pair:
Medicine: Health

(A) Science: Experiment
(B) Wealth: Peace
(C) Education: Knowledge
(D) Money: Happiness

Q. 61 to Q. 65 carry two marks each.

Q.61 X and Y are two positive real numbers such that $2X + Y \leq 6$ and $X + 2Y \leq 8$. For which of the following values of (X, Y) the function $f(X, Y) = 3X + 6Y$ will give maximum value?

(A) (4/3, 10/3)

(B) (8/3, 20/3)

(C) (8/3, 10/3)

(D) (4/3, 20/3)

Q.62 If $|4X - 7| = 5$ then the values of $2\,|X| - |-X|$ is:

(A) 2, 1/3 (B) 1/2, 3 (C) 3/2, 9 (D) 2/3, 9

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Q.63 Following table provides figures (in rupees) on annual expenditure of a firm for two years - 2010 and 2011.

Category	2010	2011
Raw material	5200	6240
Power & fuel	7000	9450
Salary & wages	9000	12600
Plant & machinery	20000	25000
Advertising	15000	19500
Research & Development	22000	26400

In 2011, which of the following two categories have registered increase by same percentage?

(A) Raw material and Salary & wages

(B) Salary & wages and Advertising

(C) Power & fuel and Advertising

(D) Raw material and Research & Development

Q.64 A firm is selling its product at Rs. 60 per unit. The total cost of production is Rs. 100 and firm is earning total profit of Rs. 500. Later, the total cost increased by 30%. By what percentage the price should be increased to maintained the same profit level.

(A) 5 (B) 10 (C) 15 (D) 30

Q.65 Abhishek is elder to Savar.
Savar is younger to Anshul.

Which of the given conclusions is logically valid and is inferred from the above statements?

(A) Abhishek is elder to Anshul

(B) Anshul is elder to Abhishek

(C) Abhishek and Anshul are of the same age

(D) No conclusion follows

END OF THE QUESTION PAPER