

Q. 1 – Q. 5 carry one mark each.

Q.1 The chairman requested the aggrieved shareholders to _____ him.

- (A) bare with (B) bore with (C) bear with (D) bare

Q.2 Identify the correct spelling out of the given options:

- (A) Managable (B) Manageable (C) Mangaable (D) Managible

Q.3 Pick the odd one out in the following:

13, 23, 33, 43, 53

- (A) 23 (B) 33 (C) 43 (D) 53

Q.4 R2D2 is a robot. R2D2 can repair aeroplanes. No other robot can repair aeroplanes.

Which of the following can be logically inferred from the above statements?

- (A) R2D2 is a robot which can only repair aeroplanes.
(B) R2D2 is the only robot which can repair aeroplanes.
(C) R2D2 is a robot which can repair only aeroplanes.
(D) Only R2D2 is a robot.

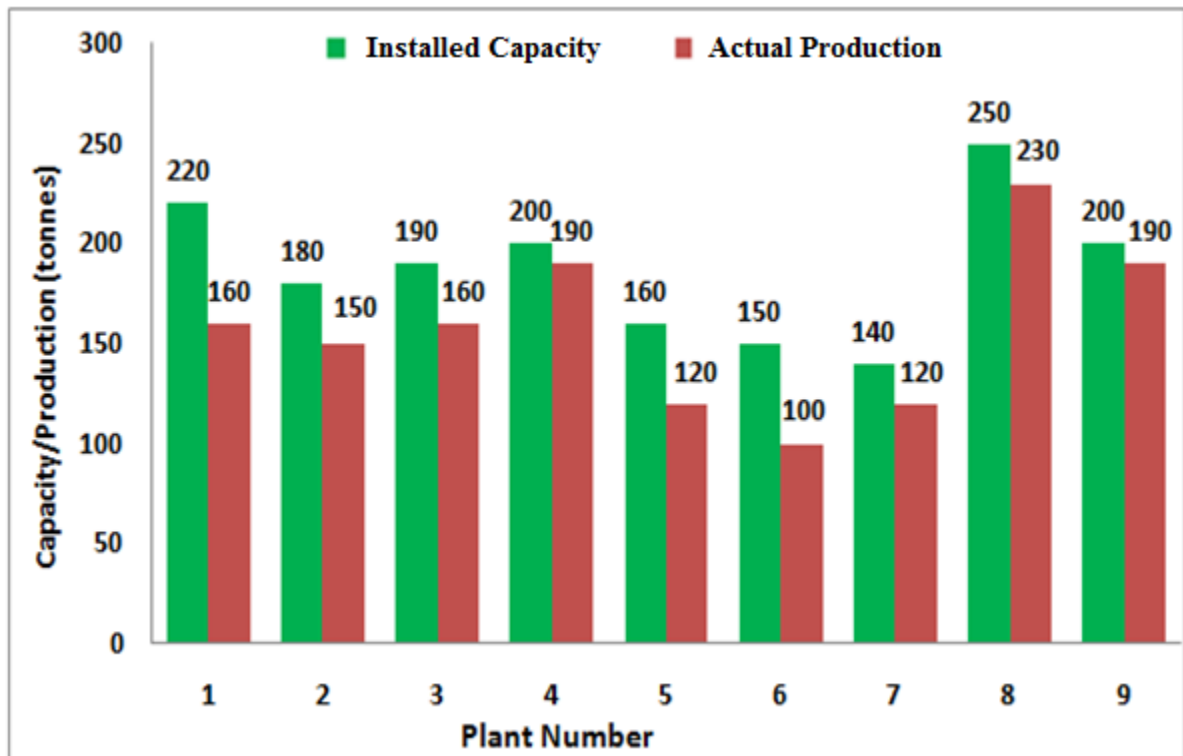
Q.5 If $|9y-6|=3$, then $y^2 - 4y/3$ is _____.

- (A) 0 (B) $+1/3$ (C) $-1/3$ (D) undefined

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Q. 6 – Q. 10 carry two marks each.

- Q.6 The following graph represents the installed capacity for cement production (in tonnes) and the actual production (in tonnes) of nine cement plants of a cement company. Capacity utilization of a plant is defined as ratio of actual production of cement to installed capacity. A plant with installed capacity of at least 200 tonnes is called a large plant and a plant with lesser capacity is called a small plant. The difference between total production of large plants and small plants, in tonnes is _____.



- Q.7 A poll of students appearing for masters in engineering indicated that 60 % of the students believed that mechanical engineering is a profession unsuitable for women. A research study on women with masters or higher degrees in mechanical engineering found that 99 % of such women were successful in their professions.

Which of the following can be logically inferred from the above paragraph?

- (A) Many students have misconceptions regarding various engineering disciplines.
- (B) Men with advanced degrees in mechanical engineering believe women are well suited to be mechanical engineers.
- (C) Mechanical engineering is a profession well suited for women with masters or higher degrees in mechanical engineering.
- (D) The number of women pursuing higher degrees in mechanical engineering is small.

- Q.8 Sourya committee had proposed the establishment of Sourya Institutes of Technology (SITs) in line with Indian Institutes of Technology (IITs) to cater to the technological and industrial needs of a developing country.

Which of the following can be logically inferred from the above sentence?

Based on the proposal,

- (i) In the initial years, SIT students will get degrees from IIT.
- (ii) SITs will have a distinct national objective.
- (iii) SIT like institutions can only be established in consultation with IIT.
- (iv) SITs will serve technological needs of a developing country.

- (A) (iii) and (iv) only. (B) (i) and (iv) only.
(C) (ii) and (iv) only. (D) (ii) and (iii) only.

- Q.9 Shaquille O' Neal is a 60% career free throw shooter, meaning that he successfully makes 60 free throws out of 100 attempts on average. What is the probability that he will successfully make exactly 6 free throws in 10 attempts?

- (A) 0.2508 (B) 0.2816 (C) 0.2934 (D) 0.6000

- Q.10 The numeral in the units position of $211^{870} + 146^{127} \times 3^{424}$ is _____.

END OF THE QUESTION PAPER

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Q. 1 – Q. 25 carry one mark each.

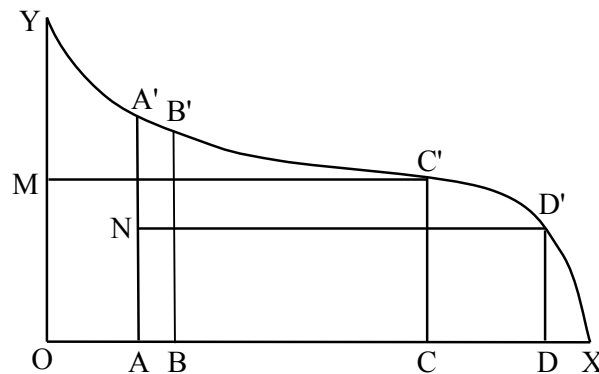
- Q.1 The following partial differential equation $U_{xx} + U_{yy} = 0$ is of the type
(A) Elliptic (B) Parabolic (C) Hyperbolic (D) Mixed type
- Q.2 Which of the following is a multi-step numerical method for solving the ordinary differential equation?
(A) Euler method (B) Improved Euler method
(C) Runge-Kutta method (D) Adams-Multon method
- Q.3 Let X be a normally distributed random variable with mean 2 and variance 4. Then, the mean of $\frac{X-2}{2}$ is equal to _____
- Q.4 Let $A = \begin{pmatrix} 1 & \frac{1}{2} \\ \frac{1}{2} & 1 \end{pmatrix}$. The determinant of A^{-1} is equal to
(A) $\frac{1}{2}$ (B) $\frac{4}{3}$ (C) $\frac{3}{4}$ (D) 2
- Q.5 Which of the following amino acids is responsible for relatively higher wet strength in wool fiber?
(A) Threonine (B) Serine (C) Cystine (D) Tryosine
- Q.6 Which one of the following stereo structures of polypropylene is (are) used for commercial fibre manufacture?
(A) Atactic
(B) Syndiotactic
(C) Isotactic & Syndiotactic
(D) Isotactic
- Q.7 Acrylic fibre has high glass transition temperature ($T_g \approx 100^\circ\text{C}$) primarily due to
(A) Presence of polar side groups
(B) Presence of bulky side groups
(C) High crystallinity
(D) Main chain stiffness
- Q.8 In which of the following polymerization methods the rate of reaction is very high and leads to uncontrolled polymerization ?
(A) Solution polymerization
(B) Suspension polymerization
(C) Bulk polymerization
(D) Emulsion polymerization
- Q.9 Which of the following textile strands is the finest?
(A) 30s Ne (B) 30 denier (C) 30 tex (D) 30s Nm
- Q.10 In a carding machine, in which of the following zones the fibre alignment is negatively affected to the maximum extent?
(A) Cylinder to flats carding region (B) Licker-in to cylinder transfer region
(C) Cylinder to doffer transfer region (D) Doffer to calendar roller region

- Q.11 Which of the following is the correct sequence of events which happen in a roller drafting zone?
- (A) Fibre elongation-fibre decrimping- fibre sliding
 - (B) Fibre sliding-fibre elongation-fibre decrimping
 - (C) Fibre decrimping- fibre sliding- fibre elongation
 - (D) Fibre decrimping- fibre elongation- fibre sliding
- Q.12 In which region of ring spinning, Coriolis force acts?
- (A) Lappet to ring cop
 - (B) Delivery pair of drafting rollers to lappet
 - (C) Back pair of drafting rollers to delivery pair of drafting rollers
 - (D) Feed bobbin to back pair of drafting rollers
- Q.13 Which of the following shuttleless weaving systems can offer maximum fabric width ?
- (A) Air jet
 - (B) Water jet
 - (C) Projectile
 - (D) Rapier
- Q.14 The filling yarn density at selvage is doubled in case of
- (A) Fringe selvage
 - (B) Tucked-in selvage
 - (C) Shuttle selvage
 - (D) Leno selvage
- Q.15 Which of the following shedding mechanisms provides control of individual warp thread during weaving ?
- (A) Crank
 - (B) Tappet
 - (C) Dobby
 - (D) Jacquard
- Q.16 The time required (minutes) to wind 10 kg of 40 tex yarn when the winding machine works at 1000 m/min with an efficiency of 90% is _____
- Q.17 The test statistic to be used for carrying out a test of hypothesis on the mean of a normal distribution with unknown variance is
- (A) Z
 - (B) T
 - (C) χ^2
 - (D) F
- Q.18 If the length of a confidence interval on the mean of a normal distribution with known variance is to be halved, the sample size must
- (A) increase by 2 times
 - (B) decrease by 2 times
 - (C) increase by 4 times
 - (D) decrease by 4 times

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Q.19 A comb sorter diagram of cotton fibres is shown below:



where $OM=0.5 OY$, $OA=0.25 OC$, $AN=0.5 AA'$, and $OB=0.25 OD$. The effective length is

- (A) AA' (B) BB' (C) CC' (D) DD'

Q.20 A fabric specimen of original length 75 mm is stretched to a length of 120 mm and after removal of the load the length reduces to 95 mm. The elastic recovery (%) of the fabric specimen is _____

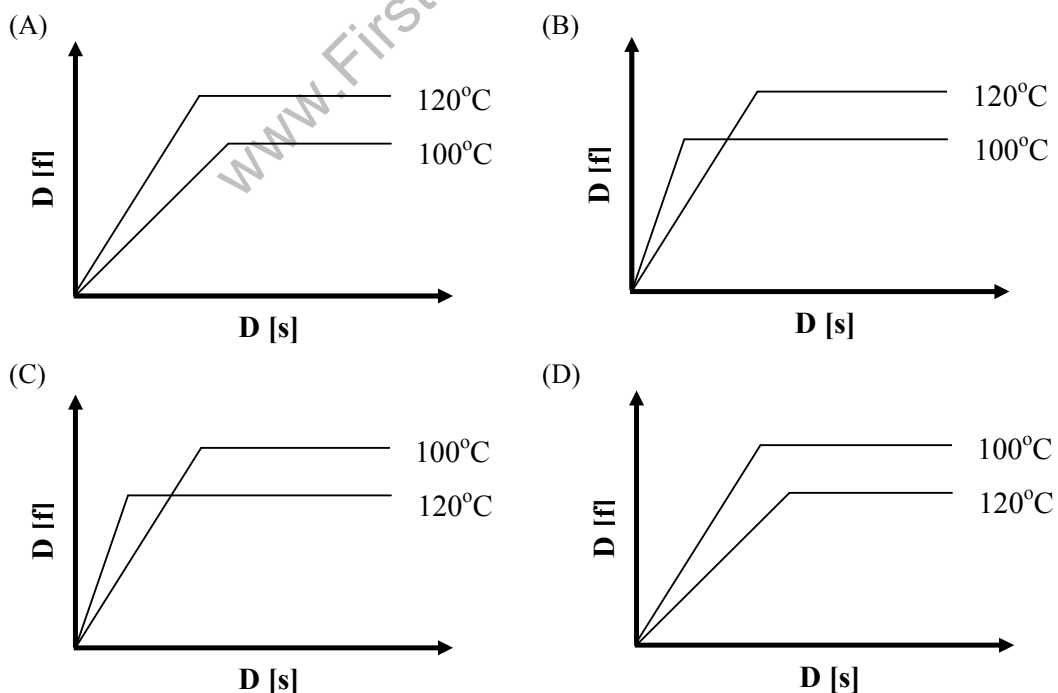
Q.21 A sector-shaped, falling-pendulum type apparatus is suitable for measurement of

- (A) Elmendorf tear strength
(B) Tongue tear strength
(C) Trapezoidal tear strength
(D) All of them

Q.22 Sodium persulphate is used in

- (A) Bleaching (B) Scouring (C) Mercerization (D) Desizing

Q.23 Polyester is dyed with a disperse dye at 100°C and 120°C till equilibrium is achieved. If $D[f]$ and $D[s]$ represent the dye in fibre and dye in solution respectively, then the correct choice for the dyeing isotherms at the two temperature will be



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Q.24 A dye with dischargeability rating of 1 (one) **WILL NOT** be suitable for

- (A) Resist printing (B) Direct printing
 (C) Discharge printing (D) Melt transfer printing

Q.25 The enzyme used for biopolishing of cotton is

- (A) Cellulase (B) Pectinase (C) Amylase (D) Lipase

Q. 26 – Q. 55 carry two marks each.

Q.26 The eigen values and eigen vectors of $\begin{pmatrix} 3 & 4 \\ 4 & -3 \end{pmatrix}$ are

- (A) ± 5 and $\begin{pmatrix} 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ respectively. (B) ± 3 and $\begin{pmatrix} 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ respectively.
 (C) ± 4 and $\begin{pmatrix} 1 \\ 2 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ respectively. (D) ± 5 and $\begin{pmatrix} 1 \\ 1 \end{pmatrix}, \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ respectively.

Q.27 Let $f(x, y, z) = \frac{1}{\sqrt{(x^2+y^2+z^2)}}$. The value of $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} + \frac{\partial^2 f}{\partial z^2}$ is equal to _____

Q.28 Let X be a continuous type random variable with probability density function

$$f(x) = \begin{cases} \frac{1}{4} & -1 \leq x \leq 3 \\ 0 & \text{otherwise} \end{cases}$$

When $P(X \leq x) = 0.75$, the value of x is equal to _____

Q.29 The integrating factor of $(2 \cos y + 4x^2)dx - x \sin y dy = 0$ is

- (A) $-x$ (B) x (C) x^2 (D) $-x^2$

Q.30 The Fourier series of periodic function $f(x) = \begin{cases} -k & -\pi < x < 0 \\ k & 0 < x < \pi \end{cases}$ and $f(x + 2\pi) = f(x)$ is given by $\frac{4k}{\pi} \left(\sin x + \frac{1}{3} \sin 3x + \frac{1}{5} \sin 5x + \dots \right)$. Then, the value of $\frac{4}{\pi} \left(1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots \right)$ is equal to _____

Q.31 Match the fibers listed in Column A with the compounds used in its manufacture listed in Column B. Choose the right answer from options A, B, C and D.

Column A

Column B

- P. Polypropylene
 Q. Polyethylene Terephthalate
 R. Nylon 6
 S. Viscose

1. Carbon disulfide
 2. Water
 3. Ziegler Natta catalyst
 4. Antimony trioxide & Antimony triacetate

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

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

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- Q.32 Consider the following assertion [a] and reason [r] and choose the correct alternative from amongst A, B, C and D.

[a] Both polyester and nylon filaments can be drawn at room temperature to achieve higher strength, modulus and dimensional stability.

[r] T_g of both polyester and nylon can be lowered to room temperature on absorption of atmospheric moisture.

- (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.33 Low pill PET fibres of a given denier can be produced by a combination of any two options listed below. Choose the right combination from A, B, C and D.

P. Lowering the IV (intrinsic viscosity) of the polymer

Q. Increasing the IV (intrinsic viscosity) of the polymer

R. Increasing the draw ratio

S. Decreasing the draw ratio

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

- Q.34 Which of the following combination of statements from options A, B, C and D is correct ?

1. X-ray Diffraction gives information about crystallinity and crystal size in semicrystalline polymers.
2. Differential Scanning Calorimetry gives information about T_g , T_m and T_c as well as enthalpy of melting and crystallization.
3. In Scanning Electron Microscopy the sample has to be coated with silver to make it conducting.
4. Birefringence is a measure of molecular orientation in amorphous phase only.

- (A) 1, 2 and 3 are correct (B) 1, 3 and 4 are correct
 (C) 2, 3 and 4 are correct (D) All are correct

- Q.35 Match the fibre in Column A with the spinning technique used to manufacture in Column B. Choose the correct alternative from options A, B, C and D.

Column A

Column B

P. Rayon

1. Dry-jet-wet spinning

Q. Aramid (Kevlar)

2. Gel Spinning

R. Ultra High Molecular weight Polyethylene

3. Melt spinning

S. Polyester

4. Wet Spinning

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

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

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

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

- Q.36 If 50 bales of 5 $\mu\text{g}/\text{inch}$, 20 bales of 3.5 $\mu\text{g}/\text{inch}$ and 40 bales of 3.0 $\mu\text{g}/\text{inch}$ cotton fibres are mixed, the resultant $\mu\text{g}/\text{inch}$ of the mixed cotton is _____

- Q.37 A rotor with 48 mm diameter running at 90,000 rpm is producing yarn at 140 m/min. The number of doublings of fibre layers in the rotor is _____

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- Q.38 Consider the following assertion [a] and reason [r] and choose the correct alternative from amongst A, B, C and D.
[a] Compared to ring spun yarns, rotor spun yarns have better evenness for the same yarn count.
[r] Rotor spun yarns have more number of fibres in the yarn cross section compared to ring spun yarns of same count.
- (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.39 The final yarn count required from a ring frame is 36s Ne with 28 TPI. The twist contraction during spinning is 3%. If the feed roving count is 2s Ne, the mechanical draft required in the ring frame will be _____
- Q.40 The diameter (mm) of a cotton yarn of 50 tex count and 0.45 packing density, assuming cotton fibre density to be 1.54 g/cm^3 , is _____
- Q.41 In needle punching process, higher punch density **CAN NOT** cause
- (A) Lower web thickness
(B) Higher change of fabric dimensions
(C) Higher damage of fibres
(D) Higher permeability of fabric
- Q.42 Which of the following features **IS NOT** found in a crepe weave
- (A) Highly irregular surface-puckered in appearance
(B) Prominent twill effect on the fabric
(C) Minute spots or seeds spread over the fabric
(D) High twist yarn with controlled shrinkage
- Q.43 The crimp% of a square cloth in which thread spacing is equal to the yarn diameter and no jamming takes place, will be _____
- Q.44 A 38 cm diameter circular knitting machine accommodates 4 needles per cm. The stitch length is 6 mm and wale constant can be assumed to be 42.2. The flat fabric width (cm) in finished - relaxed form is _____
- Q.45 The least desired feature of fibre in wet laid nonwoven fabric is
- (A) High affinity for water
(B) Low aspect ratio
(C) High flexural rigidity
(D) Low crimpiness
- Q.46 The surface area per unit volume (mm^{-1}) of a circular polyester fibre of 1.5 denier fineness and 1.38 g/cm^3 density, ignoring the fibre ends, is _____
- Q.47 The fibre packing density in a cotton bale of 170 kg weight and dimensions 1060 mm (L) \times 530 mm (W) \times 780 mm (H), assuming cotton fibre density to be 1.54 g/cm^3 , is _____
- Q.48 A cotton yarn with 5% breaking elongation needs to be tested for breaking strength in a tensile tester at 500 mm gauge length. The clamp speed (mm/min) required to break the specimen in 20 s is _____

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- Q.49 The rotational speed of a card cylinder with locally damaged card clothing is 400 rpm and the sliver delivery rate is 100 m/min. The wavelength (m) of the periodic mass variation in the card sliver is _____
- Q.50 The flexural rigidity, expressed in 10^{-4} mg·cm, of a fabric test specimen of 100 g/m² areal density and 0.40 mm length of overhang determined using a cantilever test with a standard angle of deflection of 41.5°, is _____
- Q.51 The volume strength of 1 molar H₂O₂ solution will be _____
- Q.52 Consider the following assertion [a] and reason [r] and choose the correct alternative from amongst A, B, C and D.
[a] In dyeing of polyester with disperse dyes, it is easier to obtain dark shades with solvent dyeing method than with aqueous dyeing method.
[r] The partition coefficient ($D[f]/D[s]$) of disperse dyes is much lower in aqueous medium than in a solvent.
(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.53 A reactive dye is applied on cotton fabric by continuous method. The achieved shade on fabric is 2% on the weight of fabric. The dyebath concentration is 25 gram per litre and the % expression after padding is 100. The specific gravity of the solution is 1. The fixation % of the dye on the fabric is _____
- Q.54 Consider the following assertion [a] and reason [r] and choose the correct alternative from amongst A, B, C and D.
[a] In resin finishing of cellulosic textiles, usually the curing stage is carried out in hot dry air and not in steam.
[r] The acid catalyst used in resin formulation is activated in hot air only.
(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.55 Match the printing processes in Column A with print paste components in Column B. Choose the correct alternative from options A, B, C and D.
- | Column A | Column B |
|----------------------------------|------------------------------------|
| P. Pigment printing | 1. Disperse dye |
| Q. Discharge printing | 2. Binder |
| R. Resist printing | 3. High solids content thickener |
| S. Sublimation transfer printing | 4. Sodium formaldehyde sulfoxylate |
| (A) P-2,Q-3,R-4,S-1 | (B) P-2,Q-4,R-3,S-1 |
| (C) P-2,Q-4,R-1,S-3 | (D) P-1,Q-4,R-3,S-2 |

END OF THE QUESTION PAPER