

Question Paper

Conducted by the Central Board of Secondary Education (CBSE)



Time Allowed: 2 Hours

Maximum Marks: 40

General Instructions

- (i) This question paper contains **14 questions**. All questions are compulsory.
- (ii) Section A: Questions 1 to 6 carry 2 marks each.
- (iii) Section B: Questions 7 to 10 carry 3 marks each.
- (iv) Section C: Questions 11 to 14 carry 4 marks each.
- (v) Question 14 is a case study with two subparts, each carrying 2 marks.
- (vi) Attempt one alternative where an internal choice is provided. Follow the instructions within each question.
- (vii) Use of calculators is not allowed.

Section A

1. (a) If $\frac{d}{dx}[F(x)] = \frac{\sec^4 x}{\csc^4 x}$ and $F\left(\frac{\pi}{4}\right) = \frac{\pi}{4}$, then find $F(x)$.

OR

(b) Find: $\int \frac{\log x - 3}{(\log x)^4} dx$.

2. Let A and B be two events such that $P(A) = \frac{5}{8}$, $P(B) = \frac{1}{2}$ and $P(A/B) = \frac{3}{4}$. Find the value of $P(B/A)$.

3. Two balls are drawn at random from a bag containing 2 red balls and 3 blue balls, without replacement. Let the variable X denote the number of red balls. Find the probability distribution of X.

4. Find the values of λ , for which the distance of the point $(2, 1, \lambda)$ from the plane $3x + 5y + 4z = 11$ is $2\sqrt{2}$ units.

5. Solve the differential equation: $\log\left(\frac{dy}{dx}\right) = x - y$.

6. In a parallelogram PQRS, $\vec{PQ} = 3\hat{i} - 2\hat{j} + 2\hat{k}$ and $\vec{PS} = -\hat{i} - 2\hat{k}$. Find $|\vec{PR}|$ and $|\vec{QS}|$.

Section B

7. Find the particular solution of the differential equation $\frac{dy}{dx} \cdot x \cos^2\left(\frac{y}{x}\right) = y$; given that when $x = 1$, $y = \frac{\pi}{4}$.

8. (a) If $\vec{a}$, $\vec{b}$, $\vec{c}$ and $\vec{d}$ are four non-zero vectors such that $\vec{a} \times \vec{b} = \vec{c} \times \vec{d}$ and $\vec{a} \times \vec{c} = 4\vec{b} \times \vec{d}$, then show that $(\vec{a} - 2\vec{d})$ is parallel to $(2\vec{b} - \vec{c})$, where $\vec{a} \neq 2\vec{d}$, $\vec{c} \neq 2\vec{b}$.

OR

(b) The two adjacent sides of a parallelogram are represented by $2\hat{i} - 4\hat{j} - 5\hat{k}$ and $2\hat{i} + 2\hat{j} + 3\hat{k}$. Find the unit vectors parallel to its diagonals. Using the diagonal vectors, find the area of the parallelogram also.

9. (a) Find: $\int \frac{x^3 + x}{x^4 - 9} dx$.

OR

(b) Evaluate, using properties: $\int_{-\pi}^{\pi} (3 \sin x - 2)^2 dx$.

10. Find the co-ordinates of the point on the line $\frac{x+2}{3} = \frac{y+1}{2} = \frac{z-3}{2}$ which is at a distance of 5 units from the point (1, 3, 3).

11. Evaluate: $\int_0^\pi \frac{x}{1 + \sin x} dx$.

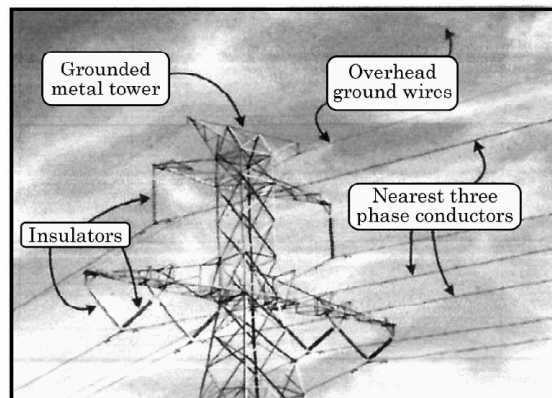
12. A man is known to speak truth 7 out of 10 times. He threw a pair of dice and reports that a doublet appeared. Find the probability that it was actually a doublet.

13. (a) Using integration, find the area of the region $\{(x, y) : 4x^2 + 9y^2 \leq 36, 2x + 3y \geq 6\}$.

OR

(b) Using integration, find the area of the region bounded by lines $x - y + 1 = 0$, $x = -2$, $x = 3$ and x-axis.

14. Electrical transmission wires which are laid down in winters are stretched tightly to accommodate expansion in summers.



Two such wires lie along the following lines:

$$l_1 : \frac{x+1}{3} = \frac{y-3}{-2} = \frac{z+2}{-1}$$

$$l_2 : \frac{x}{-1} = \frac{y-7}{3} = \frac{z+7}{-2}$$

Based on the given information, answer the following questions:

- (i) Are the lines l_1 and l_2 coplanar? Justify your answer.
- (ii) Find the point of intersection of the lines l_1 and l_2 .

- End of Question Paper -