

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. Find the sum of the order and the degree of the differential equation: $\left(x + \frac{dy}{dx}\right)^2 = \left(\frac{dy}{dx}\right)^2 + 1$.

2. 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 $|\vec{QS}|$.

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

4. 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 $P(B/A)$.

5. 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.

6. 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.

Section B

7. (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.

8. Find the vector equation of the plane passing through the intersection of the planes $\vec{r} \cdot (2\hat{i} + 2\hat{j} - 3\hat{k}) = 7$ and $\vec{r} \cdot (2\hat{i} + 5\hat{j} + 3\hat{k}) = 9$ and through the point $(2, 1, 3)$.

9. (a) Find: $\int \frac{dx}{\sqrt{x} + \sqrt[3]{x}}$.

OR

(b) Evaluate: $\int_0^{\pi/2} \frac{\cos x}{(1 + \sin x)(4 + \sin x)} dx$.

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

Section C

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

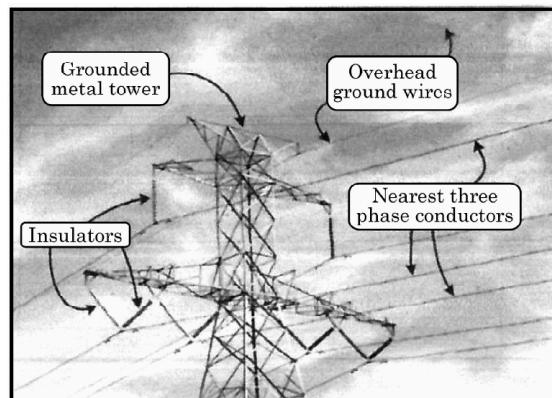
OR

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

12. A card from a pack of 52 playing cards is lost. From the remaining cards, 2 cards are drawn at random without replacement, and are found to be both aces. Find the probability that the lost card being an ace.

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

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 -