

# CBSE Class 12 Mathematics 2022 - 65-6-1 - Compartment

## 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** divided into Sections A, B and C.
- (ii) Each section is compulsory.
- (iii) Section A has 6 short answer type I questions of 2 marks each.
- (iv) Section B has 4 short answer type II questions of 3 marks each.
- (v) Section C has 4 long answer questions of 4 marks each.
- (vi) There is an internal choice in some questions.
- (vii) Question 14 is a case-study-based question with 2 subparts of 2 marks each.

## Section A

1. Evaluate:  $\int_0^{\pi/2} \frac{1}{1 + \cot^{5/2} x} dx.$

2. If  $\vec{a} = \hat{i} + \hat{j} - 2\hat{k}$ ,  $\vec{b} = -\hat{i} + 2\hat{j} + 2\hat{k}$  and  $\vec{c} = -\hat{i} + 2\hat{j} - \hat{k}$  are three vectors, find a vector perpendicular to both the vectors  $(\vec{a} + \vec{b})$  and  $(\vec{b} - \vec{c})$ .

3. A bag contains cards numbered 1 to 25. Two cards are drawn at random, one after the other, without replacement. Find the probability that the number on each card is a multiple of 7.

4. One bag contains 4 white and 5 black balls. Another bag contains 6 white and 7 black balls. A ball is drawn at random from the first bag and transferred to the second bag, and then a ball is drawn at random from the second bag. Find the probability that the ball drawn is white.

5. If  $\vec{a}$ ,  $\vec{b}$  and  $\vec{c}$  are unit vectors such that  $\vec{a} + \vec{b} + \vec{c} = \vec{0}$ , then find the value of  $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$ .

6(a). Find the general solution of the differential equation  $x \cos y dy = (x \log x + 1)e^x dx$ .

OR

6(b). If  $a$  and  $b$  represent respectively the order and the degree of the differential equation

$$x \left[ y \left( \frac{d^2 y}{dx^2} \right)^3 + x \left( \frac{dy}{dx} \right)^2 - \frac{y}{x} \frac{dy}{dx} \right] = 0,$$

find the value of  $(2a - 3b)$ .

## Section B

**7(a).** Find the area of the region  $\{(x, y) : x^2 + y^2 \leq 9, x + y \geq 3\}$ , using integration.

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OR

**7(b).** Using integration, find the area of the region bounded by the parabola  $y^2 = 4x$ , the lines  $x = 0$  and  $x = 3$  and the x-axis.

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**8.** Find:  $\int \frac{\sin x}{\sin(x - 2a)} dx$ .

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**9.** Find the equation of the plane passing through three points whose position vectors are  $-\hat{j}$ ,  $3\hat{i} + 3\hat{j}$  and  $\hat{i} + \hat{j} + \hat{k}$ .

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**10(a).** Find the distance between the following parallel lines:

$$\vec{r} = (2\hat{i} + \hat{j} - \hat{k}) + \lambda(\hat{i} + \hat{j} - \hat{k})$$

$$\vec{r} = (\hat{i} - 2\hat{j} + \hat{k}) + \mu(\hat{i} + \hat{j} - \hat{k})$$

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OR

**10(b).** Find the coordinates of the point at which the line through the points  $(-1, 1, -8)$  and  $(5, -2, 10)$  crosses the ZX-plane.

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## Section C

11. Find the equation of the plane which contains the line of 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 which passes through the point  $(2, 1, 3)$ .

12(a). Find:  $\int \cos x \cdot \tan^{-1}(\sin x) dx$ .

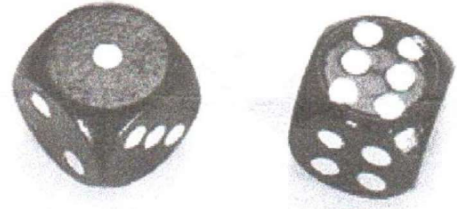
OR

12(b). Find:  $\int \frac{e^x}{(e^x + 1)(e^x + 3)} dx$ .

13. Find the particular solution of the differential equation  $x \frac{dy}{dx} + 2y = x^2 \log x$ , given  $y(1) = 1$ .

14. A biased die is tossed and the respective probabilities for various faces to turn up are as follows:

| Face        | 1   | 2    | 3    | 4    | 5    | 6 |
|-------------|-----|------|------|------|------|---|
| Probability | 0.1 | 0.24 | 0.19 | 0.18 | 0.15 | K |



Based on the above information, answer the following questions:

14(a). What is the value of K?

14(b). If a face showing an even number has turned up, then what is the probability that it is the face with 2 or 4?

- End of Question Paper -