

CBSE Class 12 Mathematics 2022 - 65-6-3 - 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. 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 $\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$.

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

OR

2(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 $(2a - 3b)$.

3. Evaluate: $\int_1^2 \log \left(\frac{3}{x} - 1 \right) dx$.

4. 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 $(\vec{b} - \vec{c})$.

5. 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.

6. 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.

Section B

7. Find the distance between the point $(3, 4, 5)$ and the point where the line $\frac{x-3}{1} = \frac{y-4}{2} = \frac{z-5}{2}$ meets the plane $x + y + z = 17$.

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

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

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

OR

8(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.

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

OR

9(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.

10. Find: $\int \sin 2x \sin 3x \, dx$.

Section C

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

OR

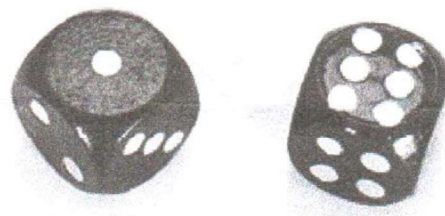
11(b). Find: $\int \frac{e^x}{(e^x + 1)(e^x + 3)} dx$.

12. Find the particular solution of the differential equation $(1 + x^2)\frac{dy}{dx} + 2xy = \tan x$, given $y(0) = 1$.

13. 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 $(2, 1, 3)$.

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 -