

CBSE

SAMPLE

QUESTION

PAPER 2021-22

BLUE PRINT

Time Allowed : 2 hours

Maximum Marks : 40

S. No.	Unit / Chapter		Section-A (2 marks)	Section-B (3 marks)	Section-C (4 marks)	Total
1.	Unit-III	Integrals	1(2)*	1(3)	1(4)	6(18)
2.		Application of Integrals	–	–	1(4)*	
3.		Differential Equations	1(2)	1(3)*	–	
4.	Unit-IV	Vector Algebra	1(2)	1(3)	–	5(14)
5.		Three Dimensional Geometry	1(2)	1(3)*	1(4)	
6.	Unit-VI	Probability	2(4)	–	1(4)	3(8)
		Total Questions	6(12)	4(12)	4(16)	14(40)

*It is a choice based question.

MATHEMATICS

Maximum Marks : 40

Time Allowed : 2 hours

General Instructions :

1. This question paper contains three sections - A, B and C. Each part is compulsory.
2. Section - A has 6 short answer type (SA1) questions of 2 marks each.
3. Section - B has 4 short answer type (SA2) questions of 3 marks each.
4. Section - C has 4 long answer type questions (LA) of 4 marks each.
5. There is an internal choice in some of the questions.
6. Q14 is a case-based problem having 2 sub parts of 2 marks each.

SECTION - A

1. Find $\int \frac{\log x}{(1+\log x)^2} dx$.

OR

Find $\int \frac{\sin 2x}{\sqrt{9-\cos^4 x}} dx$.

2. Write the sum of the order and the degree of the following differential equation.

$$\frac{d}{dx} \left(\frac{dy}{dx} \right) = 5$$

3. If \vec{a} and \vec{b} are unit vectors, then prove that $|\vec{a} + \vec{b}| = 2 \cos \frac{\theta}{2}$, where θ is the angle between them.

4. Find the direction cosines of the following line:

$$\frac{3-x}{-1} = \frac{2y-1}{2} = \frac{z}{4}$$

5. A bag contains 1 red and 3 white balls. Find the probability distribution of the number of red balls if 2 balls are drawn at random from the bag one-by-one without replacement.
6. Two cards are drawn at random from a pack of 52 cards one-by-one without replacement. What is the probability of getting first card red and second card Jack?

SECTION - B

7. Find : $\int \frac{x+1}{(x^2+1)x} dx$.

8. Find the general solution of the following differential equation.

$$x \frac{dy}{dx} = y - x \sin \left(\frac{y}{x} \right)$$

OR

Find the particular solution of the following differential equation, given that $y = 0$ when $x = \frac{\pi}{4}$.

$$\frac{dy}{dx} + y \cot x = \frac{2}{1 + \sin x}$$

9. If $\vec{a} \neq \vec{0}$, $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c}$, $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$, then show that $\vec{b} = \vec{c}$.

10. Find the shortest distance between the following lines :

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

$$\vec{r} = (\hat{i} + \hat{j} + 2\hat{k}) + t(4\hat{i} + 2\hat{j} + 2\hat{k})$$

OR

Find the vector and the cartesian equations of the plane containing the point

$$\hat{i} + 2\hat{j} - \hat{k} \text{ and parallel to the lines } \vec{r} = (\hat{i} + 2\hat{j} + 2\hat{k}) + s(2\hat{i} - 3\hat{j} + 2\hat{k}) = 0 \text{ and } \vec{r} = (3\hat{i} + \hat{j} - 2\hat{k}) + t(\hat{i} - 3\hat{j} + \hat{k}) = 0$$

SECTION - C

11. Evaluate : $\int_{-1}^2 |x^3 - 3x^2 + 2x| dx$

12. Using integration, find the area of the region in the first quadrant enclosed by the line $x + y = 2$, the parabola $y^2 = x$ and the x -axis.

OR

Using integration, find the area of the region $\{(x, y) : 0 \leq y \leq \sqrt{3x}, x^2 + y^2 \leq 4\}$.

13. Find the foot of the perpendicular from the point $(1, 2, 0)$ upon the plane $x - 3y + 2z = 9$. Hence, find the distance of the point $(1, 2, 0)$ from the given plane.

CASE-BASED/DATA-BASED

14. An insurance company believes that people can be divided into two classes: those who are accident prone and those who are not. The company's statistics show that an accident-prone person will have an accident at sometime within a fixed one-year period with probability 0.6, whereas this probability is 0.2 for a person who is not accident prone. The company knows that 20 percent of the population is accident prone.



Based on the given information, answer the following questions.

- What is the probability that a new policyholder will have an accident within a year of purchasing a policy?
- Suppose that a new policyholder has an accident within a year of purchasing a policy. What is the probability that he or she is accident prone?