All India 2021-22

CBSE Board Sample Paper Term-II

Time Allowed : 2 Hours | ***Maximum Marks : 40***

General Instructions:

(i) This question paper contains **three** sections – **A**, **B** and **C**. Each part is compulsory.
(ii) Section-**A** has **6** short answer type (SA1) questions of **2** marks each.
(iii) Section-**B** has **4** short answer type (SA2) questions of **3** marks each.
(iv) Section-**C** has **4** long answer type questions (LA) of **4** marks each.
(v) There is an internal choice in some of the questions.
(vi) Question **14** is a case-based problem having **2** sub parts of **2** marks each.

SECTION - A

Question Nos. 1 to 6 carry 2 marks each.

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 $\hat{a}$ and $\hat{b}$ are unit vectors, then prove that

$|\hat{a}+\hat{b}| = 2\cos\frac{\theta}{2}$, 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

Question Nos. 7 to 10 carry 3 marks each.

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 $\vec{a} \neq \vec{0}, \vec{a}.\vec{b} = \vec{a}.\vec{c}, \vec{a}\times\vec{b} = \vec{a}\times\vec{c}$, 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 $\hat{i} + 2\hat{j} - \hat{k}$ and parallel to the lines

$\vec{r} = (\hat{i} + 2\hat{j} + 2\hat{k}) + s(2\hat{i} - 3\hat{j} + 2\hat{k})$ and

$\vec{r} = (3\hat{i} + \hat{j} - 2\hat{k}) + t(\hat{i} - 3\hat{j} + \hat{k})$

SECTION - C

Question Nos. 11 to 14 carry 4 marks each.

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

$$\{(x, y) : 0 \leq y \leq \sqrt{3}x, x^2 + y^2 \leq 4\}$$

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 above information, answer the following questions

(a) What is the probability that a new policyholder will have an accident within a year of purchasing a policy?

(b) 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?