CBSE
Class XII Mathematics
Board Paper
Term 2 – 2022

Time: 2 Hours **Total Marks: 40**

General Instructions:
Read the following instructions very carefully and strictly follow them:

(i) This question paper contains **three** sections – **Section 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 type questions of **4** marks each. $\overline{5}$
(vi) There is an internal choice in some questions.
(vii) Question no. **14** is a case-study based question with 2 sub-parts of **2** marks each.

SECTION A

Questions number **1** to **6** carry **2** marks each.

1. A bag contains 3 red and 4 white balls. Three balls are drawn at random, one-by-one without replacement from the bag. If the first ball drawn is red in colour, then find the probability that the remaining two balls drawn are also red in colour. [2]

2. A coin is tossed twice. The following table shows the probability distribution of number of tails:

X	0	1	2
P(X)	K	6K	9K

(a) Find the value of K.
(b) Is the coin tossed biased or unbiased? Justify your answer. [2]

3. The foot of a perpendicular drawn from the point (–2, –1, –3) on a plane is (1, –3, 3). Find the equation of the plane. [2]

4. (a) If $|\vec{a} \times \vec{b}|^2 + |\vec{a} \cdot \vec{b}|^2 = 400$ and $|\vec{b}| = 5$, then find the value of $|\vec{a}|$. [2]

OR

(b) Find all the possible vectors of magnitude $5\sqrt{3}$ which are equally inclined to the coordinate axes. [2]

5. Find the general solution of the differential equation
$\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$ [2]

6. Evaluate: [2]

$$\int_0^1 x^2 e^x dx$$

SECTION B

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

8. (a) Find [3]

$$\int \frac{1}{e^x + 1} dx$$

OR

(b) Evaluate: [3]

$$\int_1^4 (|x| + |3 - x|) dx$$

9. If $\vec{a}, \vec{b}$ and $\vec{c}$ are mutually perpendicular vectors of equal magnitude, then prove that the vector $(2\vec{a} + \vec{b} + 2\vec{c})$ is equally inclined to both $\vec{a}$ and $\vec{c}$. Also, find the angle between $\vec{a}$ and $(2\vec{a} + \vec{b} + 2\vec{c})$. [3]

10. (a) If a line makes 60^o and 45^o angles with the positive directions of x-axis and z-axis respectively, then find the angle that it makes with the positive direction of y-axis. Hence, write the direction cosines of the line. [3]

OR

(b) Check whether the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = z$ are skew or not.[3]

SECTION C

Questions number **11** to **14** carry **4** marks each.

11. Find the equations of the planes passing through the line of intersection of the planes $\vec{r}.(\hat{i} + 3\hat{j}) = 6$ and $\vec{r}.(3\hat{i} - \hat{j} - 4\hat{k}) = 0$, which are at a distance of 1 unit from the origin. [4]

12. (a) Find the particular solution of the differential equation $x\frac{dy}{dx} + y + \frac{1}{1+x^2} = 0$, given that y (1) = 0. [4]

OR

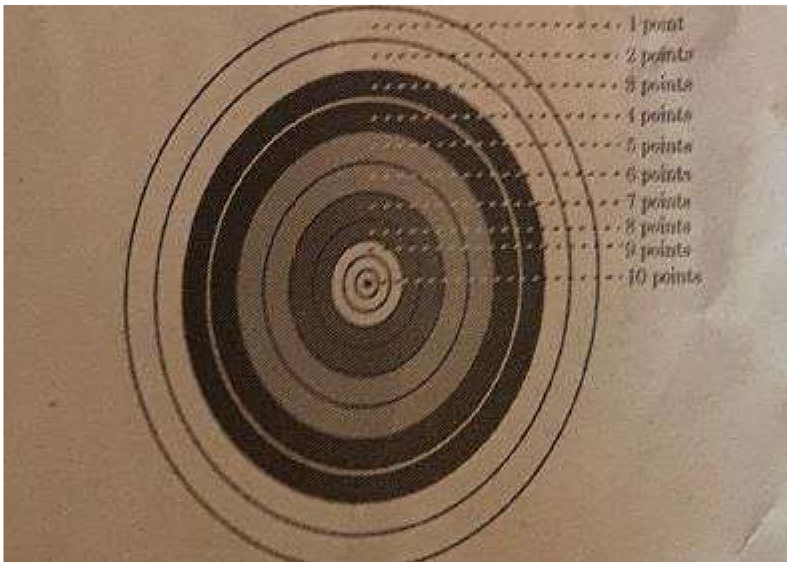
(b) Find the general solution of the differential equation $x (y^3 + x^3) dy = (2y^4 + 5x^3y) dx$. [4]

13. Evaluate: [4]

$$\int_0^{\pi/2} (2 \log \cos x - \log \sin 2x) dx$$

Case-Study Based Question

14. In a game of Archery, each ring of the Archery target is valued. The centremost ring is worth 10 points and rest of the rings are allotted points 9 to 1 in sequential order moving outwards.
Archer A is likely to earn 10 points with a probability of 0.8 and Archer B is likely the earn 10 points with a probability of 0.9.



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Based on the above information, answer the following questions:
If both of them hit the Archery target, then find the probability that
(a) Exactly one of them earns 10 points. [2]
(b) Both of them earn 10 points. [2]