Roll No. ☐☐☐☐☐☐☐☐

Q.P. Code 65/2/1

MATHEMATICS (TERM II)

CBSE Class XII Board Examination 2022 (Term 2)

Time allowed: 2 hours **Maximum Marks: 40**

General Instructions:

1. The paper has 14 questions in three sections: A, B and C. All sections are compulsory.
2. Section A: 6 short answer (type I) questions of 2 marks each.
3. Section B: 4 short answer (type II) questions of 3 marks each.
4. Section C: 4 long answer questions of 4 marks each.
5. Some questions offer an internal choice; attempt only one of the alternatives.
6. Question 14 is case-study based, with 2 sub-parts of 2 marks each.

SECTION A

Q1–6 carry 2 marks each.

1. For the differential equation $\left[\frac{d}{dx}(xy^2)\right] \cdot \frac{dy}{dx} + y = 0$, find the product of its order and its degree. **2**

2. Find $\int \frac{\sin 3x}{\sin x}\, dx$. **2**

OR

Evaluate $\int_0^{\frac{1}{2}\log 3} \frac{e^x}{e^{2x}+1}\, dx$.

3. $\vec{a}$ and $\vec{b}$ are unit vectors with $|2\vec{a} + 3\vec{b}| = |3\vec{a} - 2\vec{b}|$. Find the angle between $\vec{a}$ and $\vec{b}$. **2**

4. Two dice are thrown together and we are told the sum of the two numbers is even. What is the probability that at least one die shows 3? **2**

5. A can solve a particular problem with probability 2/3 and B with probability 3/5. Working independently, both attempt it. Find the probability that the problem gets solved. **2**

6. Line PQ joins P(2, 2, 1) and Q(5, 1, −2). Write its cartesian equation, and then find the y-coordinate of the point on PQ whose z-coordinate is −2. **2**

SECTION B

Q7–10 carry 3 marks each.

7. In parallelogram ABCD the diagonals are $\vec{AC} = \hat{i} + \hat{j}$ and $\vec{BD} = 2\hat{i} + \hat{j} + \hat{k}$. Find $\vec{AB}$ and $\vec{AD}$, and the area of ABCD. **3**

8. Evaluate $\int_0^1 \tan^{-1} x \, dx$. **3**

OR

Find $\int \frac{2x}{x^2 + 3x + 2} \, dx$.

9. Find the particular solution of the differential equation $(y + 3x^2)\frac{dx}{dy} = x$, given that y = 1 when x = 1. **3**

10. Find the equation of the plane through (2, 1, 0), (3, −2, −2) and (1, 1, −7), and its distance from the origin. **3**

OR

Find the distance between the lines $x = \frac{y-1}{2} = \frac{z-2}{3}$ and $x + 1 = \frac{y+2}{2} = \frac{z-1}{3}$.

SECTION C

Q11–14 carry 4 marks each. Q14 is a case-study based question.

11. The line $\frac{x-2}{3} = \frac{y+1}{4} = \frac{z-2}{12}$ meets the plane x − y + z = 5 at a point. Find the distance of this point from (−1, −5, −10). **4**

12. Evaluate $\int_0^1 x(1-x)^n \, dx$. **4**

13. Using integration, find the area of the smaller region cut off from the circle $4x^2 + 4y^2 = 9$ by the line 2x + 2y = 3. **4**

OR

The region bounded by the parabola $y^2 = 4ax$ and the line x = 4a has area 256/3 square units. Using integration, find a (a > 0).

14. At the start of a cricket match a fair coin (head and tail equally likely) is tossed, and the team that wins the toss chooses to bat or bowl. Answer the following: **4**

(a) If this coin is tossed twice, find the probability distribution of the number of tails.

(b) Find the probability of getting at least one head when the coin is tossed three times.

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Questions restated from the CBSE Class XII Board Examination 2022 (set 65/2/1) for practice. Reading passages and map items are described, not reproduced.