Navodaya Vidyalaya Samiti
Pre-Board Exams 2021-22
Class – XII
Subject – Mathematics (041), TERM-II

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

General Instructions:

1. This question paper contains three sections – A, B and C. Each section is compulsory.
2. Section- A has 6 **Short Answer Type Questions** of 2 marks each.
3. Section- B has 4 **Short Answer Type Questions** of 3 marks each.
4. Section- C has 4 **LongAnswer Type Questions** of 4 marks each.
5. There is an **internal choice** in some of the questions.
6. Q 14 is a **case –based problem** having 2 sub parts of 2 marks each.

SECTION – A

Q1. Find: $\int \frac{1}{\sqrt{x}(1+x)} \, dx$

OR

Find: $\int \frac{\sin(x-2)}{\sin(x-5)} \, dx$

Q2. Write the degree and order of the following differential equation:

$$\frac{d}{dx}\left(\frac{dy}{dx} + y\right) = 3 + \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

Q3. Find the Cartesian equation of the line which passes through the point (-2 , 4 , -5) and parallel to the line given by $\frac{x+3}{3} = \frac{4-y}{-5} = \frac{z+8}{6}$

Q4. Two balls are drawn at random with replacement from a box containing 8 black and 12 red balls. Find the probability that one of them is black and other is red.

Q5. Let X denotes the sum of the numbers obtained when two fair dice are rolled. Find the probability distribution of X.

Q6. If $\hat{a}$ and $\hat{b}$ are unit vectors such that $\left|\sqrt{3}\hat{a} - \hat{b}\right| = 1$ then find the angle between the vectors $\hat{a}$ and $\hat{b}$.

SECTION – B

Q7. Find $\int \frac{x^2 + 1}{x^2(x^2 + 4)} \, dx$

Q8. Let $\vec{a}, \vec{b}$ and $\vec{c}$ be three vectors such that $|\vec{a}| = 1$, $|\vec{b}| = 2, |\vec{c}| = 3$ and each one of them being perpendicular to the sum of other two then find $\left|\vec{a} + \vec{b} + \vec{c}\right|$.

Q9. If points (1, 1, P) and (-3, 0, 1) be equidistant from the plane $\vec{r} \cdot \left(3\hat{\imath} + 4\hat{\jmath} - 12\hat{k} \right) + 13 = 0$, then find the value of P.

OR

Find the vector equation of the line passing through the point (1, 2, -4) and perpendicular to the lines $\frac{x-8}{3} = \frac{y+19}{-16} = \frac{z-10}{7}$ and $\frac{x-15}{3} = \frac{y-29}{8} = \frac{z-5}{-5}$

Q10. Find the general solution of the differential equation y. $e^{\frac{x}{y}}$ dx $= ($ x . $e^{\frac{x}{y}} + y^2$)dy

OR

Find the particular solution of the differential equation

$\cos x \frac{dy}{dx} + y \sin x = (1 + \sin x)$, given that y = 1 when x= 0.

SECTION –C

Q11. Find the equation of the plane through the line of intersection of the planes x +y + z=1 and 2x + 3y + 4z = 5 and which is perpendicular to the plane x – y + z = 0.

Q12. Evaluate: $\int_{-3}^{1} |x^2 + x - 2| \, dx$

Q13. Using method of integration, Find the area of the region {(x, y): $0 \le y \le x^2 + 1, 0 \le y \le x + 1, 0 \le x \le 2$}.

OR

Using method of integration, Find the area bounded by the curve $|x| + |y| = 1$.

Q14. **CASE-BASED/ DATA-BASED**

In a factory which manufactures bolts, machines A, B and C manufacture respectively 25%, 35% and 40% of the bolts. Of their outputs, 5%,4% and 2% are respectively defective bolts.

Based on the given information, answer the following questions.

    (i)   A bolt is drawn at random from the product, what is the probability that drawn bolt is defective?

    (ii)   A bolt is drawn at random from the product is found to be defective, what is the probability that it is manufactured by the machine B?