# SAMPLE QUESTION PAPER

## CLASS: XII

## Session: 2021-22

## Mathematics (Code-041)

## Term - 2

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

**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 : $\int \frac{x}{1-9x^4} dx$ **[2]**

**OR**

Find : $\int e^x \left(\frac{\sin 4x - 4}{1 - \cos 4x}\right) dx$

**2.** Find the order & degree of differential equation $\left(\frac{dy}{dx}\right)^{3/2} = \frac{d^2y}{dx^2} + x$. **[2[**

**3.** If θ is the angle between two vectors $\hat{i} - 2\hat{j} + 3\hat{k}$ and $3\hat{i} - 2\hat{j} + \hat{k}$, find sinθ. **[2]**

**4.** Find the direction cosines of the ray from P to Q where P is point (1,–2,2) and Q is the point (3,–5,–4). **[2]**

**5.** Find the probability distribution of X, the number of heads in a simultaneous toss of two coins. **[2]**

**6.** A purse contains 3 silver and 6 copper coins and a second purse contains 4 silver and 3 copper coins. If a coin is drawn at random from one of the two purses, find the probability that it is a silver coin. **[2]**

## SECTION – B

**7.** Find : $\int \frac{x^3}{(x-1)(x^2+1)} dx$ **[3]**

**8.** Solve the differential equation : $x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$ **[3]**

**OR**

Find the particular solution of the differential equation $\frac{dy}{dx} + 2y\tan x = \sin x$, given that y = 0 when $x = \frac{\pi}{3}$.

**9.** The scalar product of the vector $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ with a unit vector along the sum of the vectors $\vec{b} = 2\hat{i} + 4\hat{j} - 5\hat{k}$ and $\vec{c} = \lambda\hat{i} + 2\hat{j} + 3\hat{k}$ is equal to 1. Find the value of λ and hence find the unit vector along $\vec{b} + \vec{c}$. **[3]**

**10.** Find the shortest distance between the lines $\vec{r} = (4\hat{i} - \hat{j}) + \lambda(\hat{i} + 2\hat{j} - 3\hat{k})$ and $\vec{r} = (\hat{i} - \hat{j} + 2\hat{k}) + \mu(2\hat{i} + 4\hat{j} - 5\hat{k})$. **[3]**

**OR**

Find the distance of the point (–1, –5, –10) from the point of intersection of the line $\vec{r} = 2\hat{i} - \hat{j} + 2\hat{k} + \lambda(3\hat{i} + 4\hat{j} + 2\hat{k})$ and the plane $\vec{r} \cdot (\hat{i} - \hat{j} + \hat{k}) = 5$.

## SECTION – C

**11.** Evaluate : $\int_{-1}^{2} |x^3 - x|\, dx$ **[4]**

**12.** Using integration, find the area of the region $\{(x, y) : x^2 + y^2 \le 1 \le x + y\}$. **[4]**

**OR**

Using the method of integration, find the area of the triangle ABC, coordinates of whose vertices are A(4, 1), B(6, 6) and C(8, 4).

**13.** Find the vector and cartesian equations of the plane passing through the points having position vectors $\hat{i} + \hat{j} - 2\hat{k}, 2\hat{i} - \hat{j} + \hat{k}$ and $\hat{i} + 2\hat{j} + \hat{k}$. Write the equation of a plane passing through a point (2, 3, 7) and parallel to the plane obtained above. Hence, find the distance between the two parallel planes. **[4]**

## CASE BASED / DATA BASED

**14.** The reliability of a COVID PCR test is specified as follows :

Of people having COVID, 90% of the test detects the disease but 10% goes undetected. Of people free of COVID, 99% of the test is judged COVID negative but 1% are diagnosed as showing COVID positive. From a large population of which only 0.1% have COVID, one person is selected at random, given the COVID PCR test, and the pathologist reports him/her as COVID positive.

**Based on the above information, answer the following :**

**(i)** Find the probability that the 'person is actually having COVID given that 'he is tested as COVID positive' ? **[2]**

**(ii)** Find the probability that the 'person selected will be diagnosed as COVID positive' ? **[2]**