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 $\int \frac{logx}{(1+logx)^2}dx$ OR Find $\int \frac{sin2x}{\sqrt{9-cos^4x}}dx$	2
2.	Write the sum of the order and the degree of the following differential equation: $\frac{d}{dx}\left(\frac{dy}{dx}\right) = 5$	2
3.	If $\hat{a}$ and $\hat{b}$ are unit vectors, then prove that $\left\|\hat{a} + \hat{b}\right\| = 2cos\frac{\theta}{2}$, where θ is the angle between them.	2
4.	Find the direction cosines of the following line: $\frac{3-x}{-1} = \frac{2y-1}{2} = \frac{z}{4}$	2
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.	2
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?	2

SECTION – B

7.	Find: $\int \frac{x+1}{(x^2+1)x}dx$	3
8.	Find the general solution of the following differential equation: $x\frac{dy}{dx} = y - xsin(\frac{y}{x})$ OR Find the particular solution of the following differential equation, given that y = 0 when x = $\frac{\pi}{4}$: $\frac{dy}{dx} + ycotx = \frac{2}{1+sinx}$	3
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 $\vec{b} = \vec{c}$.	3

10.	Find the shortest distance between the following lines: $\vec{r} = (\hat{\imath} + \hat{\jmath} - \hat{k}) + s(2\hat{\imath} + \hat{\jmath} + \hat{k})$ $\vec{r} = (\hat{\imath} + \hat{\jmath} + 2\hat{k}) + t(4\hat{\imath} + 2\hat{\jmath} + 2\hat{k})$ OR Find the vector and the cartesian equations of the plane containing the point $\hat{\imath} + 2\hat{\jmath} - \hat{k}$ and parallel to the lines $\vec{r} = (\hat{\imath} + 2\hat{\jmath} + 2\hat{k}) + s(2\hat{\imath} - 3\hat{\jmath} + 2\hat{k})$ and $\vec{r} = (3\hat{\imath} + \hat{\jmath} - 2\hat{k}) + t(\hat{\imath} - 3\hat{\jmath} + \hat{k})$	3
	SECTION – C	
11.	Evaluate: $\int_{-1}^{2} \lvert x^3 - 3x^2 + 2x \rvert dx$	4
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 $\{(x, y): 0 \leq y \leq \sqrt{3}x, x^2 + y^2 \leq 4\}$	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.	4
14.	**CASE-BASED/DATA-BASED**  Fig 1 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 given information, answer the following questions.**	
	(i)what is the probability that a new policyholder will have an accident within a year of purchasing a policy?	2
	(ii) 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?	2
