

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 $\int \frac{\log x}{(1+\log x)^2} dx$ OR Find $\int \frac{\sin 2x}{\sqrt{9-\cos^4 x}} dx$	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 $ \hat{a} + \hat{b} = 2\cos \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: $x \frac{dy}{dx} = y - x \sin \left(\frac{y}{x} \right)$ OR Find the particular solution of the following differential equation, given that $y = 0$ when $x = \frac{\pi}{4}$: $\frac{dy}{dx} + y \cot x = \frac{2}{1 + \sin x}$	3
9.	If $\vec{a} \neq \vec{0}$, $\vec{a} \cdot \vec{b} = \vec{a} \cdot \vec{c}$, $\vec{a} \times \vec{b} = \vec{a} \times \vec{c}$, then show that $\vec{b} = \vec{c}$.	3

10.	<p>Find the shortest distance between the following lines: $\vec{r} = (\hat{i} + \hat{j} - \hat{k}) + s(2\hat{i} + \hat{j} + \hat{k})$ $\vec{r} = (\hat{i} + \hat{j} + 2\hat{k}) + t(4\hat{i} + 2\hat{j} + 2\hat{k})$</p> <p style="text-align: center;">OR</p> <p>Find the vector and the cartesian equations of the plane containing the point $\hat{i} + 2\hat{j} - \hat{k}$ and parallel to the lines $\vec{r} = (\hat{i} + 2\hat{j} + 2\hat{k}) + s(2\hat{i} - 3\hat{j} + 2\hat{k})$ and $\vec{r} = (3\hat{i} + \hat{j} - 2\hat{k}) + t(\hat{i} - 3\hat{j} + \hat{k})$</p>	3
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SECTION - C

11.	Evaluate: $\int_{-1}^2 x^3 - 3x^2 + 2x dx$	4
12.	<p>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.</p> <p style="text-align: center;">OR</p> <p>Using integration, find the area of the region $\{(x, y): 0 \leq y \leq \sqrt{3}x, x^2 + y^2 \leq 4\}$</p>	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

CASE-BASED/DATA-BASED

14.	<div style="text-align: center;">  </div> <p>Fig 1</p> <p>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.</p> <p>Based on the given information, answer the following questions.</p>	
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	(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