

Sample Question Paper

CLASS: XII

Session: 2021-22

Mathematics

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 $\int \log(x + \sqrt{x^2 + a^2}) dx$<br><br>OR<br><br>Find $\int \frac{\sin 2x}{a \cos^2 x + b \sin^2 x + c} dx$   | 2 |
| 2. | Write the sum of the order and the degree of the following differential equation: $\tan^{-1} \sqrt{\frac{dy}{dx}} = x$  | 2 |
| 3. | If $\vec{p} = (5\hat{i} + \lambda\hat{j} - 3\hat{k})$ and $\vec{q} = (\hat{i} + 3\hat{j} - 5\hat{k})$ , then find the value of $\lambda$ , so that $\vec{p} + \vec{q}$ and $(\vec{p} - \vec{q})$ are perpendicular vectors. | 2 |
| 4. | Find the cartesian equation of a line which passes through the point (1, 2, 3) and is parallel to the line $\frac{-x-2}{1} = \frac{y+3}{7} = \frac{2z-6}{3}$  | 2 |
| 5. | An urn contains 3 white, 4 red and 5 black balls. Two balls are drawn one by one without replacement. What is the probability that at least one ball is black?  | 2 |
| 6. | Given the probability that A can solve a problem is $\frac{2}{3}$ and the probability that B can solve the same problem is $\frac{3}{5}$ . Find the probability that none of the two will be able to solve problem.         | 2 |

**SECTION B**

- |    |   |   |
|----|---|---|
| 7. | Find: $\int \frac{x^2 + 1}{(x^2 + 4)(x^2 + 25)} dx$   | 3 |
| 8. | Find the general solution of the following differential equation: $(x + y)^2 \frac{dy}{dx} = 1$<br><br>OR<br><br>Find the particular solution of the following differential equation, given that,<br>$(1 + y^2) dx + (x - e^{-\tan^{-1} y}) dy = 0; y(0) = 0$ | 3 |
| 9. | If $ \vec{a}  = \sqrt{26};  \vec{b}  = 7$ and $ \vec{a} \times \vec{b}  = 35$ , find $(\vec{a} \cdot \vec{b})$ .  | 3 |

10.	<p>Find the shortest distance between the following lines</p> $\vec{r} = (2\hat{i} - \hat{j} - \hat{k}) + \lambda(2\hat{i} - 5\hat{j} + 2\hat{k})$ <p>and <math>\vec{r} = (\hat{i} + 2\hat{j} + \hat{k}) + u(\hat{i} - \hat{j} + \hat{k})</math></p> <p style="text-align: center;">OR</p> <p>Find the vector and cartesian equation of the plane that contains the line of intersection of the planes, <math>\vec{r} \cdot (\hat{i} + 2\hat{j} + 3\hat{k}) - 4 = 0</math> and <math>\vec{r} \cdot (2\hat{i} + \hat{j} - \hat{k}) + 5 = 0</math> and which is perpendicular to the plane <math>\vec{r} \cdot (5\hat{i} + 3\hat{j} - 6\hat{k}) + 8 = 0</math>.</p>	3
<b><u>SECTION C</u></b>		
11.	<p>Evaluate: <math>\int_{-1}^2 ( x + 1  +  x  +  x - 1 ) dx</math></p>	4
12.	<p>Using integration, Find the area of the region between the circles <math>x^2 + y^2 = 16</math> and <math>(x - 2)^2 + y^2 = 4</math>.</p> <p style="text-align: center;">OR</p> <p>Using integration, Find the area of the region <math>\{(x, y): x^2 + y^2 \leq 4, x + y \geq 2\}</math></p>	4
13.	<p>Find the reflection of the point <math>(1, 2, -1)</math> in the plane <math>3x - 5y + 4z = 5</math>. Hence, find the distance of the point <math>(1, 2, -1)</math> from the given plane.</p>	4
14.	<p style="text-align: center;"><b><u>CASE-BASED/DATA-BASED</u></b></p> <div style="text-align: center;">  </div> <p>In a group of 400 people, 160 are smokers and non-vegetarian, 100 are smokers and vegetarian and the remaining are non-smokers and vegetarian. The probabilities of getting a special chest disease are 35%, 20% and 10% respectively.</p> <p><b>Based on the given information, answer the following questions.</b></p>	
	<p>(i) A person is chosen from at random from non-smokers and vegetarian group. What is the probability that the selected person be suffering from the disease?</p>	2
	<p>(i) A person is chosen from the group at random and is found to be suffering from the disease. What is the probability that the selected person is a smoker and non-vegetarian?</p>	2