

## 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 :  $\int \frac{x^3 + x}{x^4 - 9} dx$  (2)

OR

Find :  $\int \frac{e^x(x+1)}{(x+3)^3} dx$

2. Find the order & degree of differential equation  $\left(\frac{d^4y}{dx^4}\right)^3 + \sin\left(\frac{dy}{dx}\right) + \frac{d^2y}{dx^2} = 0$  (2)
3. Find the angle between unit vectors  $\vec{a}$  and  $\vec{b}$  so that  $\sqrt{3}\vec{a} - \vec{b}$  is also a unit vector. (2)
4. Find the coordinates of the point where the line  $\frac{x-1}{3} = \frac{y+4}{7} = \frac{z+4}{2}$  cuts the xy-plane. (2)
5. A purse contains 4 copper and 3 silver coins and another purse contains 6 copper and 2 silver coins. One coin is drawn from any one of these two purses. Find the probability that it is a copper coin. (2)
6. A black and a red die are rolled together. Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4. (2)

## SECTION – B

7. Evaluate :  $\int \frac{x^2 + x + 1}{(x^2 + 1)(x + 2)} dx$  (3)
8. Show that the differential equation  $x \cos\left(\frac{y}{x}\right) \frac{dy}{dx} = y \cos\left(\frac{y}{x}\right) + x$  is homogenous and solve it. (3)

OR

Find the particular solution of differential equation :  $\frac{dy}{dx} = -\frac{x + y \cos x}{1 + \sin x}$  given that  $y = 1$  when  $x = 0$ .

9. If  $\vec{a} = \hat{i} + \hat{j} + \hat{k}$  and  $\vec{b} = \hat{j} - \hat{k}$ , find a vector  $\vec{c}$  such that  $\vec{a} \times \vec{c} = \vec{b}$  and  $\vec{a} \cdot \vec{c} = 3$ . (3)

10. Find the shortest distance between the following lines : (3)

$$\vec{r} = (\hat{i} + 2\hat{j} + 3\hat{k}) + \lambda(2\hat{i} + 3\hat{j} + 4\hat{k})$$

$$\vec{r} = (2\hat{i} + 4\hat{j} + 5\hat{k}) + \mu(4\hat{i} + 6\hat{j} + 8\hat{k})$$

OR

Find the equation of the plane passing through the line of intersection of the planes  $2x + y - z = 3$  and  $5x - 3y + 4z + 9 = 0$  and parallel to the line  $\frac{x-1}{2} = \frac{y-3}{4} = \frac{5-z}{-5}$ .

### SECTION - C

11. Evaluate :  $\int_{-2}^2 \frac{x^2}{1+5^x} dx$  (4)

12. Using integration, find the area of the region bounded by the triangle whose vertices are  $(-1, 2)$ ,  $(1, 5)$  and  $(3, 4)$ . (4)

OR

Using integration, find the area of the following region:  $\{(x, y) : |x - 1| \leq y \leq \sqrt{5 - x^2}\}$

13. Find the equation of the plane which contains the line the intersection of the planes  $\vec{r} \cdot (\hat{i} - 2\hat{j} + 3\hat{k}) - 4 = 0$  and  $\vec{r} \cdot (-2\hat{i} + \hat{j} + \hat{k}) + 5 = 0$  and whose intercept on x-axis is equal to that on y-axis. (4)

### CASE BASED / DATA BASED

14. In answering a question on a multiple choice test for class XII, a student either knows the answer or guesses. Let  $3/5$  be the probability that he knows the answer and  $2/5$  be the probability that he guesses. Assume that a student who guesses at the answer will be correct with probability  $1/3$ . Let  $E_1$ ,  $E_2$ ,  $E$  be the events that the student knows the answer, guesses the answer and answers correctly respectively.



Based on the above information, answer the following :

(i) Find the value of  $\sum_{k=1}^{k=2} P(E|E_k) P(E_k)$  (2)

(ii) Find the probability that the student knows the answer given that he answered it correctly ? (2)