

**Pre-Board Examinations**  
**CLASS: XII**  
**Session: 2021-22**  
**Mathematics (Code-041)**  
**Term – 2**

**SET 1**

**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 ( 2 marks )**

1. Find  $\int \frac{(x^4-x)^{\frac{1}{4}}}{x^5} dx$

**OR**

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

2. Verify that the function  $y = a \cos x + b \sin x$ , where  $a, b \in \mathbb{R}$ , is a solution of the differential equation:  $\frac{d^2y}{dx^2} + y = 0$
3. Find the projection of the vector  $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$  on the vector  $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$
4. If the lines  $\frac{1-x}{3} = \frac{y-2}{2k} = \frac{z-3}{2}$  and  $\frac{x-1}{3k} = y - 1 = \frac{6-z}{5}$  are perpendicular, find the value of  $k$
5. Three cards are drawn successively, without replacement from a pack of 52 well shuffled cards. What is the probability that the first two cards are kings and the third card drawn is an ace?
6. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails

**SECTION – B ( 3 marks )**

7. Find  $\int \frac{(3 \sin \theta - 2) \cos \theta}{5 - \cos^2 \theta - 4 \sin \theta} d\theta$

8. Find the general solution of the equation

$$2y e^{x/y} dx + (y - 2x e^{x/y}) dy = 0$$

**OR**

Find the particular solution of the following, given that  $y = 1$ , when  $x = 0$

$$(e^{-2\sqrt{x}} - y) dx = \sqrt{x} dy$$

9. Find all the vectors of magnitude  $7\sqrt{3}$  that are perpendicular to both  $\hat{i} + 2\hat{j} + \hat{k}$  and  $-\hat{i} + 3\hat{j} + 4\hat{k}$

10. Find the equation of the plane passing through the intersection of the planes  $2x + 2y - 3z = 7$ ,  $2x + 5y + 3z = 9$  and through the point  $(2, 1, 3)$

**OR**

Find the coordinate of the point where the line through the point  $A(3, 4, 1)$  and  $B(5, 1, 6)$  crosses the  $XY$ -plane

**SECTION – C ( 4 marks )**

11. Evaluate  $\int_{\pi/6}^{\pi/3} \frac{\sin x + \cos x}{\sqrt{\sin 2x}} dx$

12. Find the area enclosed by the curve  $y = -x^2$  and the line  $x + y + 2 = 0$

**OR**

Find the area bounded by the curve  $y^2 = x$ ,  $x = 2y + 3$  in the first quadrant and  $x$ -axis

13. Find the image of the point  $(1, 3, 4)$  in the plane  $x + 2y - z + 3 = 0$

**14. CASE-BASED/DATA-BASED**



A courier service company sends 30% of its orders by air, 50% by bus and remaining 20% by train. Past record shows the courier is delivered late 2%, 7% and 5% of the time when orders are sent by air, bus and train respectively.

**Based on the given information, answer the following questions.**

- Find (i) the probability that the order will be delivered late  
(ii) the probability that the parcel delivered to a customer is sent by train if it is delivered late.

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