

This Question Paper contains 20 printed pages.
(Part - A & Part - B)

Sl.No.

050 (E)

(MARCH, 2019)
SCIENCE STREAM
(CLASS - XII)

Part - A : Time : 1 Hour / Marks : 50

Part - B : Time : 2 Hours / Marks : 50

પ્રશ્ન પેપરનો સેટ નંબર જેની
સામેનું વર્તુળ OMR શીટમાં
ઘટ્ટ કરવાનું રહે છે.
Set No. of Question Paper,
circle against which is to be
darken in OMR sheet.

09

(Part - A)

Time : 1 Hour]

[Maximum Marks : 50

Instructions :

- 1) There are 50 objective type (M.C.Q.) questions in Part - A and all questions are compulsory.
- 2) The questions are serially numbered from 1 to 50 and each carries 1 mark.
- 3) Read each question carefully, select proper alternative and answer in the O.M.R. sheet.
- 4) The OMR Sheet is given for answering the questions. The answer of each question is represented by (A) O, (B) O, (C) O, (D) O. Darken the circle ● of the correct answer with ball-pen.
- 5) Rough work is to be done in the space provided for this purpose in the Test Booklet only.
- 6) Set No. of Question Paper printed on the upper- most right side of the Question Paper is to be written in the column provided in the OMR sheet.
- 7) Use of simple calculator and log table is allowed, if required.
- 8) Notations used in this question paper have proper meaning.

- 1) The number of binary operations on {1,2} is _____

- (A) 8
(B) 16
(C) 2
(D) 4

Rough Work

- 2) Functions $f: \mathbb{R}^+ \rightarrow \mathbb{R}^+, f(x) = x^3, g: \mathbb{R}^+ \rightarrow \mathbb{R}^+, g(x) = x^{1/3}$
then $(f \circ g)(x) =$ _____

(A) x^3

(B) $\frac{1}{x}$

(C) $\sqrt[3]{x}$

(D) x

- 3) The domain of $\sin^{-1}$ is _____

(A) $[0, 1]$

(B) $(-\infty, \infty)$

(C) $[0, \pi]$

(D) $[-1, 1]$

- 4) $\cos\left(\cos^{-1}\left(-\frac{1}{4}\right) + \sin^{-1}\left(-\frac{1}{4}\right)\right) =$ _____

(A) $\frac{1}{3}$

(B) $\frac{4}{9}$

(C) 0

(D) $-\frac{1}{3}$

- 5) The value of $\sin^{-1}\left(\sin \frac{5\pi}{3}\right) =$ _____

(A) $\frac{5\pi}{3}$

(B) $-\frac{\pi}{3}$

(C) $\frac{\pi}{3}$

(D) $\frac{2\pi}{3}$

6) $\sec^2(\tan^{-1} 3) + \operatorname{cosec}^2(\cot^{-1} 3) = \underline{\hspace{2cm}}$

(A) 20

(B) 15

(C) 13

(D) 25

7) $\begin{vmatrix} \sin 35^\circ & -\cos 35^\circ \\ \sin 55^\circ & \cos 55^\circ \end{vmatrix} = \underline{\hspace{2cm}}$

(A) 1

(B) 0

(C) -1

(D) 2

8) If $A = \begin{bmatrix} 2x & 9 \\ -3 & -2 \end{bmatrix}$ and $|A| = 3$, then $x = \underline{\hspace{2cm}}$; $x \in \mathbb{R}$

(A) 7.5

(B) 6

(C) 15

(D) 12

9) If $A = [a_{ij}]_{n \times n}$ such that $a_{ij} = 0$, for $i \neq j$, then A is _____

$(a_{ii} \neq a_{jj}), (n > 1)$

(A) a row matrix

(B) a column matrix

(C) a diagonal matrix

(D) a scalar matrix

Rough Work

10) $\frac{d}{dx}(e^{\sin^{-1}x + \cos^{-1}x}) = \underline{\hspace{2cm}}, (|x| < 1)$

(A) $\frac{2}{\sqrt{1-x^2}}$

(B) 0

(C) $\frac{1}{\sqrt{1-x^2}}$

(D) $e^{\sin^{-1}x + \cos^{-1}x}$

11) $f(x) = \begin{cases} \frac{\sin 4x}{9x}, & x \neq 0 \\ k^2, & x = 0 \end{cases}$ if f is continuous for $x = 0$, then

$k = \underline{\hspace{2cm}}$

(A) $-\frac{3}{2}$

(B) $\frac{3}{2}$

(C) $\pm\frac{2}{3}$

(D) $\frac{4}{9}$

12) If $x = at^2$, $y = 2at$, then $\frac{dy}{dx} = \underline{\hspace{2cm}}, (t \neq 0)$

(A) $\frac{1}{t}$

(B) t

(C) $-t$

(D) a

Rough Work

13) $\frac{d}{dx}(\log_5 x^2) = \underline{\hspace{2cm}}$

(A) $\frac{1}{(\log 5)x}$

(B) $\frac{1}{x^2}$

(C) $\frac{2}{(\log 5)x}$

(D) $\frac{1}{(\log 5)x^2}$

14) The derivative of $\tan^{-1} x$ with respect to $\cot^{-1} x$ is $\underline{\hspace{2cm}}$, ($x \in \mathbb{R}$)

(A) -1

(B) 1

(C) $\frac{1}{1+x^2}$

(D) $-\frac{1}{1+x^2}$

15) $\int \frac{dx}{\sqrt{4-3x}} = \underline{\hspace{2cm}} + C$

(A) $-\frac{2}{3}(4+3x)^{\frac{1}{2}}$

(B) $-\frac{2}{3}(4-3x)^{-\frac{1}{2}}$

(C) $-\frac{2}{3}(4-3x)^{\frac{1}{2}}$

(D) $\frac{2}{3}(4+3x)^{\frac{1}{2}}$

Rough Work

16) $\int \frac{e^{5\log x} - e^{4\log x}}{e^{3\log x} - e^{2\log x}} dx = \underline{\hspace{2cm}} + C$

(A) $e^3 \log x$

(B) $e \cdot 3^{-3x}$

(C) $\frac{x^3}{3}$

(D) $\frac{x^2}{3}$

- 17) Let A and B be two events such that $P(A) = 0.4$, $P(A \cup B) = 0.6$ and $P(B) = p$. For which choice of p , A and B are independent?

(A) $\frac{1}{3}$

(B) $\frac{1}{2}$

(C) $\frac{3}{4}$

(D) $\frac{5}{6}$

- 18) If A and B are two events such that $P(A) > 0$ and $P(B) \neq 1$, then $P\left(\frac{A}{B'}\right)$ is _____

(A) $1 - P\left(\frac{A}{B}\right)$

(B) $1 - P\left(\frac{A}{B'}\right)$

(C) $\frac{P(A')}{P(B)}$

(D) $1 - P\left(\frac{A'}{B'}\right)$

- 19) If parameters of a binomial distribution are $n = 5$ and $p = 0.30$, then the variance is _____

(A) 1.05

(B) 1.5

(C) 1.40

(D) 1.15

20) If the probability distribution $P(x) = C \binom{4}{x}; x = 0, 1, 2, 3, 4,$

then $C =$ _____.

- (A) 0 (B) $\frac{1}{4}$
(C) 4 (D) $\frac{1}{16}$

21) The objective function of an LP problem is _____

- (A) a function to be optimized
(B) a constant
(C) an inequality
(D) a quadratic equation

22) The corner points of the feasible region determined by the system of linear constraints are $(0, 10), (5, 5), (15, 15), (5, 25)$. Let $z = px + qy$, where $p, q > 0$. The condition on p and q so that the maximum of z occurs at both the points $(15, 15)$ and $(5, 25)$ is _____.

- (A) $p = 2q$
(B) $p = q$
(C) $q = 2p$
(D) $q = 3p$

23) Approximate value of $(31)^{\frac{1}{5}}$ is _____

- (A) 2.1 (B) 2.01
(C) 2.0125 (D) 1.9875

24) The local minimum value of $f(x) = x^2 + 4x + 5$ is _____, $(x \in \mathbb{R})$

(A) 4

(B) 2

(C) 1

(D) -1

25) $\int \log x \, dx = \text{_____} + C$

(A) $x \log x - x$

(B) $x \log x + x$

(C) $\frac{1}{x}$

(D) $\log x - x$

26) $\int \sqrt{16 - x^2} \, dx = \text{_____} + C$

(A) $\frac{x}{2} \sqrt{16 - x^2} + 8 \sin^{-1} \frac{x}{4}$

(B) $\frac{x}{2} \sqrt{16 - x^2} + 4 \sin^{-1} \frac{x}{4}$

(C) $\frac{x}{2} \sqrt{16 - x^2} + 8 \log |x + \sqrt{16 - x^2}|$

(D) $\frac{x}{2} \sqrt{16 - x^2} + 4 \log |x + \sqrt{16 - x^2}|$

27) $\int e^x \left(\frac{1 + \sin x}{1 + \cos x} \right) dx = \underline{\hspace{2cm}} + C.$

(A) $e^x \cot \frac{x}{2}$

(B) $e^x \cot x$

(C) $e^x \tan \frac{x}{2}$

(D) $e^{\frac{x}{2}} \tan \frac{x}{2}$

28) $\int (x^2 + 3x + 2) e^x dx = \underline{\hspace{2cm}} + C$

(A) $(x^2 + x + 1) e^x$

(B) $(x^2 - x + 1) e^x$

(C) $(x^2 + x - 1) e^x$

(D) $(x^2 - 1) e^x$

29) $\int_0^{\pi} \sin^2 x \cos^3 x dx = \underline{\hspace{2cm}}$

(A) 1

(B) 0

(C) -1

(D) π

30) The area enclosed by $y = \cos x$, $-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$ and the X-axis is $\underline{\hspace{2cm}}$

(A) 4

(B) 1

(C) 2

(D) π

31) The area bounded by $y = 2x - x^2$ and X - axis is _____

- (A) $\frac{2}{3}$ (B) $\frac{1}{3}$
(C) 1 (D) $\frac{4}{3}$

32) The area bounded by the curves $y = |x - 5|$, X - axis and the lines $x = 0$, $x = 1$ is _____

- (A) $\frac{7}{2}$
(B) $\frac{9}{2}$
(C) 9
(D) 5

33) The area enclosed by $y = x$, $y = 1$, $y = 3$ and the Y-axis is _____

- (A) $\frac{9}{2}$ (B) 2
(C) 4 (D) $\frac{3}{2}$

34) The order and degree of $\frac{d^2y}{dx^2} = \sqrt[3]{1 + \left(\frac{dy}{dx}\right)^2}$ are _____

respectively.

- (A) 2,3
(B) 3,2
(C) 3, not defined
(D) 2, 2

- 35) An Integrating factor of the differential equation

$$\frac{dy}{dx} + \frac{y}{x} = x^2 \text{ is } \underline{\hspace{2cm}}$$

- (A) x (B) $\frac{1}{x}$
(C) e^x (D) $\log x$

- 36) The number of arbitrary constants in the particular solution of a differential equation of second order is _____

- (A) 2 (B) 4
(C) 1 (D) 0

- 37) The solution of the differential equation $2x \frac{dy}{dx} - y = 0$; $y(1) = 2$ represents _____

- (A) Parabola (B) Straight line
(C) Circle (D) Ellipse

- 38) If $\vec{x} = (2, 3, \sqrt{3})$, then a unit vector in the direction of $\vec{x}$ is _____

- (A) $\left(\frac{1}{2}, \frac{3}{2}, \frac{\sqrt{3}}{4}\right)$ (B) $\left(\frac{1}{4}, \frac{3}{4}, \frac{\sqrt{3}}{4}\right)$
(C) $\left(\frac{1}{2}, \frac{3}{4}, \frac{\sqrt{3}}{4}\right)$ (D) $\left(\frac{1}{4}, \frac{3}{2}, \frac{\sqrt{3}}{2}\right)$

39) Magnitude of the projection of $(-1, 2, -1)$ on $\hat{i}$ is _____.

(A) $-\frac{1}{\sqrt{6}}$

(B) $\frac{1}{\sqrt{6}}$

(C) 1

(D) -1

40) If $A(3, -1)$, $B(2, 3)$ and $C(5, 1)$, then $m \angle A =$ _____

(A) $\pi - \cos^{-1} \frac{3}{\sqrt{34}}$

(B) $\cos^{-1} \frac{3}{\sqrt{34}}$

(C) $\sin^{-1} \frac{5}{\sqrt{34}}$

(D) $\frac{\pi}{2}$

41) If $\vec{x} \cdot \vec{y} = 0$, then $\vec{x} \times (\vec{x} \times \vec{y}) =$ _____, where $|\vec{x}| = 1$

(A) $\vec{x}$

(B) $\vec{x} \times \vec{y}$

(C) $-\vec{y}$

(D) $\vec{y} \times \vec{x}$

42) If $A(1, 1, 2)$, $B(2, 3, 5)$, $C(1, 3, 4)$ and $D(0, 1, 1)$ are the vertices of a parallelogram ABCD, then its area is _____

(A) 2

(B) $\sqrt{3}$

(C) $\frac{\sqrt{3}}{2}$

(D) $2\sqrt{3}$

- 43) The perpendicular distance from point $(-1, 2, -2)$ to plane $3x - 4y + 2z + 44 = 0$ is _____

(A) $2\sqrt{29}$ (B) $\frac{\sqrt{29}}{2}$
 (C) $\sqrt{29}$ (D) 1

- 44) If the lines $\frac{x-5}{7} = \frac{y-5}{k} = \frac{z-2}{1}$ and $\frac{x}{1} = \frac{y-3}{2} = \frac{z+1}{3}$ are perpendicular to each other; then $k =$ _____

(A) 5 (B) 10
 (C) -5 (D) 0

- 45) The equation of the line passing through the points $(2, 2, -3)$ and $(1, 3, 5)$ is _____

(A) $\frac{x+1}{2} = \frac{y-1}{2} = \frac{z+8}{-3}$
 (B) $\frac{x-2}{-1} = \frac{y-2}{1} = \frac{z+3}{8}$
 (C) $\frac{x+2}{-1} = \frac{y+2}{1} = \frac{z-3}{8}$
 (D) $\frac{x-1}{2} = \frac{y+1}{-2} = \frac{z-8}{3}$

- 46) Plane $2x + 3y + 6z - 15 = 0$ makes angle of measure _____ with X-axis.

(A) $\sin^{-1} \frac{3}{7}$ (B) $\cos^{-1} \frac{3\sqrt{5}}{7}$
 (C) $\sin^{-1} \frac{2}{\sqrt{7}}$ (D) $\tan^{-1} \frac{2}{7}$

Rough Work

- 47) If $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$ lies in the plane $2x - 4y + z = 7$, then $k =$ _____
- (A) 7
(B) 6
(C) -7
(D) any value of $k \in \mathbb{R}$
- 48) If $a*b = a^2 + b^2 + ab + 2$ on $\mathbb{Z}$, then $4*3 =$ _____
- (A) 39
(B) 40
(C) 25
(D) 41
- 49) The relation $S = \{(1,1), (2,2), (3,3), (4,4), (5,5)\}$ on $\{1,2,3,4,5\}$ is _____
- (A) reflexive only
(B) symmetric only
(C) transitive only
(D) an equivalence relation
- 50) Function $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = 5x + 7$ is _____
- (A) one - one and onto
(B) one - one but not onto
(C) not one - one but onto
(D) not one - one and not onto

050 (E)

(MARCH, 2019)
SCIENCE STREAM
(CLASS - XII)

(Part - B)**Time : 2 Hours]****[Maximum Marks : 50****Instructions :**

- 1) Write in a clear legible handwriting.
- 2) There are three sections in Part - B of the question paper and total 1 to 18 questions are there.
- 3) All the questions are compulsory. Internal options are given.
- 4) The numbers at right side represent the marks of the question.
- 5) Start new section on new page.
- 6) Maintain sequence.
- 7) Use of simple calculator and log table is allowed, if required.

SECTION - A

- Answer the following 1 to 8 questions as directed in the question. (Each question carries 2 marks) [16]

- 1) Let $A = \{1, 2, 3\}$, $B = \{1, 4, 9\}$, $f: A \rightarrow B$, $f(x) = x^2$. Find f^{-1} and verify $f^{-1} \circ f = I_A$, $f \circ f^{-1} = I_B$.

- 2) Without expanding, show that 11 divides $\begin{vmatrix} 2 & 6 & 4 \\ 5 & 0 & 6 \\ 3 & 5 & 2 \end{vmatrix}$

- 3) Find $\frac{dy}{dx}$ from $x + y = \sin(xy)$.

- 4) Let $O(0,0)$, $A(35,0)$, $B(30,10)$, $C(15,25)$ and $D(0,30)$ be the vertices of the feasible region of LP problem. Find the maximum and minimum values of the objective function $z = 300x + 600y$.
- 5) Prove that $y = ax^3$, $x^2 + 3y^2 = b^2$ are orthogonal.
- 6) Find the area bounded by the parabola $y = x^2 + 2$, X - axis and the lines $x = 1$ and $x = 2$.

OR

Using Integration, find the area of the region bounded by the line $2y = -x + 8$, X - axis and the lines $x = 2$ and $x = 4$.

- 7) Find a , b , c if $a(1,3,2) + b(1,-5,6) + c(2,1,-2) = (4,10,-8)$.

- 8) Evaluate, $\int_0^{\frac{\pi}{2}} \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$.

OR

Prove that $\int_0^n f(x) dx = \sum_{r=1}^n \int_0^1 f(t+r-1) dt$

SECTION - B

- Answer the following 9 to 14 questions as directed in the question. (Each question carries 3 marks)

[18]

- 9) Prove that

$$\tan\left(\frac{\pi}{4} + \frac{1}{2} \cos^{-1} \frac{a}{b}\right) + \tan\left(\frac{\pi}{4} - \frac{1}{2} \cos^{-1} \frac{a}{b}\right) = \frac{2b}{a}$$

10) Solve :

$$\begin{vmatrix} x & 2 & 2 \\ 7 & -2 & -6 \\ 5 & 4 & 3 \end{vmatrix} + \begin{vmatrix} 7 & -2 & -6 \\ 5 & 4 & 3 \\ 1 & 5 & 6 \end{vmatrix} = \begin{vmatrix} 5 & 3 & 7 \\ 4 & 7 & -2 \\ 3 & 8 & -6 \end{vmatrix}$$

11) Probability distribution of a random variable X is as follows:

X = x	-2	-1	0	1	2
P(x)	0.2	0.1	0.3	0.3	0.1

Find

- a) E(X)
- b) V(X)
- c) E(3X+2)

OR

Three machines A,B,C produce respectively 50%, 30% and 20% of the total number of items of a factory. The percentage of defective output of these machines are 3%, 4% and 5% respectively. If an item is selected at random, find the probability that the item is non-defective.

12) Find : $\int x\sqrt{2ax-x^2} dx$

OR

Find : $\int \frac{\sqrt{\sin x}}{\cos x} dx$

13) Solve : $xy(y+1) dy = (x^2+1) dx$

14) If a line makes angles of measures $\alpha, \beta, \gamma, \delta$ with the four diagonals of a cube

prove that $\cos 2\alpha + \cos 2\beta + \cos 2\gamma + \cos 2\delta = -\frac{4}{3}$

SECTION - C

- Answer the questions no. 15 to 18 as directed in the question. (Each question carries 4 marks) [16]

15) $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 5A + 11I_3 = 0$. Using this matrix relation, obtain A^{-1} .

16) Obtain : $\int \frac{x^2}{x^2 + 7x + 10} dx$

- 17) A water tank is in the shape of an inverted cone. The radius of the base is 4m and the height is 6 m. The tank is being emptied for cleaning at the rate of $3 \text{ m}^3/\text{min}$ find the rate at which the water level will be decreasing, when the water is 3 m deep.

OR

A cylindrical can is to be made to hold 1 l oil. Find its radius and height to minimize the cost.

18) Prove that : $\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} dx = \frac{1}{\sqrt{2}} \log(\sqrt{2} + 1)$

X X X