This Question Paper contains 20 printed pages.
(Part - A & Part - B)
Sl.No.

050 (E)

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

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

(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 _________ **Rough Work**

(A) 8

(B) 16

(C) 2

(D) 4

Rough Work

2) Functions $f : R^+ \to R^+, f(x) = x^3$, $g : R^+ \to R^+, g(x) = x^{1/3}$ then $(fog)(x) =$ ________

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

Rough Work

6) $\sec^2\left(\tan^{-1}3\right)+\text{cosec}^2\left(\cot^{-1}3\right)=$ ________

(A) 20 (B) 15

(C) 13 (D) 25

7) $\begin{vmatrix}\sin 35° & -\cos 35° \\ \sin 55° & \cos 55°\end{vmatrix}=$ ________

(A) 1

(B) 0

(C) −1

(D) 2

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

(A) 7.5

(B) 6

(C) 15

(D) 12

9) If $A=\left[a_{ij}\right]_{n\times n}$ such that $a_{ij}=0$, for $i\neq j$, then A is ______ $\left(a_{ii}\neq a_{jj}\right),(n>1)$

(A) a row matrix

(B) a column matrix

(C) a diagonal matrix

(D) a scalar matrix

Rough Work

10) $\frac{d}{dx}\left(e^{\sin^{-1}x+\cos^{-1}x}\right) =$ ______, $(|x|<1)$

(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 $k =$ ________

(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 $\frac{dy}{dx} =$ ________, $(t \neq 0)$

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

(B) t

(C) $-t$

(D) a

Rough Work

13) $\frac{d}{dx}\left(\log_5 x^2\right) = $ ________

(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 ______, $(x \in R)$

(A) -1

(B) 1

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

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

15) $\int \frac{dx}{\sqrt{4-3x}} = $ ________ $+ C$.

(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) $\int \frac{e^{5\log x} - e^{4\log x}}{e^{3\log x} - e^{2\log x}} dx =$ ________ $+ C$

(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 $P\left(A/_{B'}\right)$ is ________

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

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

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

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

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

Rough Work

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 ______, $(x \in R)$

(A) 4 (B) 2

(C) 1 (D) -1

Rough Work

25) $\int \log x \, dx =$ ________ $+ C$

(A) $x \log x - x$

(B) $x \log x + x$

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

(D) $\log x - x$

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

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

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

Rough Work

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

(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) $\int\left(x^2+3x+2\right)e^x dx =$ ________ $+ C$

(A) $\left(x^2+x+1\right)e^x$

(B) $\left(x^2-x+1\right)e^x$

(C) $\left(x^2+x-1\right)e^x$

(D) $\left(x^2-1\right)e^x$

29) $\int_0^{\pi} \sin^2 x \cos^3 x \, dx =$ ________

(A) 1 (B) 0

(C) -1 (D) π

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

(A) 4 (B) 1

(C) 2 (D) π

Rough Work

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 $\frac{dy}{dx}+\frac{y}{x}=x^2$ is ________

(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 $\overline{x}=\left(2,3,\sqrt{3}\right)$, then a unit vector in the direction of $\overline{x}$ 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) $\left(\frac{1}{4},\frac{3}{2},\frac{\sqrt{3}}{2}\right)$

Rough Work

Rough Work

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 $\bar{x}\cdot\bar{y}=0$, then $\bar{x}\times(\bar{x}\times\bar{y})$ = ______, where $|\bar{x}|=1$

(A) $\bar{x}$ (B) $\bar{x}\times\bar{y}$

(C) $-\bar{y}$ (D) $\bar{y}\times\bar{x}$

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) $2\sqrt{3}$

Rough Work

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

(A) $2\sqrt{29}$ (B) $\dfrac{\sqrt{29}}{2}$

(C) $\sqrt{29}$ (D) 1

44) If the lines $\dfrac{x-5}{7} = \dfrac{y-5}{k} = \dfrac{z-2}{1}$ and $\dfrac{x}{1} = \dfrac{y-3}{2} = \dfrac{z+1}{3}$ 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) $\dfrac{x+1}{2} = \dfrac{y-1}{2} = \dfrac{z+8}{-3}$

(B) $\dfrac{x-2}{-1} = \dfrac{y-2}{1} = \dfrac{z+3}{8}$

(C) $\dfrac{x+2}{-1} = \dfrac{y+2}{1} = \dfrac{z-3}{8}$

(D) $\dfrac{x-1}{2} = \dfrac{y+1}{-2} = \dfrac{z-8}{3}$

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

(A) $\sin^{-1}\dfrac{3}{7}$ (B) $\cos^{-1}\dfrac{3\sqrt{5}}{7}$

(C) $\sin^{-1}\dfrac{2}{\sqrt{7}}$ (D) $\tan^{-1}\dfrac{2}{7}$

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 $k \in R$

48) If $a*b = a^2+b^2+ab+2$ on 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) transistive only

(D) an equivalence relation

50) Function $f: R \to R, f(x) = 5x + 7$ 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 $A = \{1,2,3\}$, $B=\{1,4,9\}$, $f: A \to B$, $f(x) = x^2$. Find f^{-1} and verify $f^{-1} of = I_A$, $fof^{-1} = I_B$.

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

3) Find $\dfrac{dy}{dx}$ 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, $\int_0^{1/2} \frac{x \sin^{-1} x}{\sqrt{1-x^2}} dx$.

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 m^3/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 : $\int_0^{\pi/2} \frac{\sin^2 x}{\sin x + \cos x} dx = \frac{1}{\sqrt{2}} \log\left(\sqrt{2} + 1\right)$

x x x