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 ________

(A) 8

(B) 16

(C) 2

(D) 4

Rough Work

Rough Work

2) Functions $f: \mathrm{R}^+ \to \mathrm{R}^+, f(x) = x^3$, $g: \mathrm{R}^+ \to \mathrm{R}^+, g(x) = x^{1/3}$ 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) $\sec^2\left(\tan^{-1}3\right)+\operatorname{cosec}^2\left(\cot^{-1}3\right)=$ ________

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

(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∪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) ≠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

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

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) $\int (x^2 + 3x + 2) e^x dx =$ __________ $+ C$

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

(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

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

Rough Work

(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

Rough Work

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

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) $\frac{\sqrt{29}}{2}$
(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 $k \in R$

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 $f^{-1} o f = I_A$, $f o f^{-1} = I_B$.

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, $\int_0^{1/2} \frac{x\sin^{-1}x}{\sqrt{1-x^2}}\,dx$.

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

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