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

Sl.No.

050 (E)

(FEBRUARY-MARCH, 2025)
(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.**
08

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 OMR 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 and (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.**

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1) The area of the triangle with vertices A(1,1, 2), B(2, 3, 5) and C(1, 5, 5) is ________.

(A) $\frac{\sqrt{71}}{2}$ (B) $\frac{\sqrt{51}}{2}$

(C) $\frac{\sqrt{61}}{2}$ (D) $\frac{\sqrt{41}}{2}$

Rough Work

Rough Work

2) If θ is the angle between any two vectors $\vec{a}$ and $\vec{b}$, then $|\vec{a}\cdot\vec{b}|=|\vec{a}\times\vec{b}|$ when θ is ______.

(A) π

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

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

(D) 0

3) If $\vec{a}=\hat{i}-7\hat{j}+7\hat{k}$ and $\vec{b}=3\hat{i}-2\hat{j}+2\hat{k}$, then $|\vec{a}\times\vec{b}|=$ ______.

(A) 38

(B) 19

(C) 0

(D) $19\sqrt{2}$

4) The cartesian equation of the line which passes through the point (–2, 4, –5) and parallel to the line given by $\frac{x+3}{3}=\frac{y-4}{5}=\frac{z+8}{6}$.

(A) $\bar{r}=(-2,-4,5)+k(3,5,6);\ k\in R$

(B) $\frac{x+2}{3}=\frac{y+4}{5}=\frac{z-5}{6}$

(C) $\bar{r}=(-2,4,-5)+k(3,5,6);\ k\in R$

(D) $\frac{x+2}{3}=\frac{y-4}{5}=\frac{z+5}{6}$

Rough Work

5) The angle between the pair of lines $\frac{x+3}{3}=\frac{y-1}{-5}=\frac{z+3}{4}$ and $\frac{x+1}{1}=\frac{y-4}{1}=\frac{z-5}{2}$ is ______.

(A) $\cos^{-1}\left(\frac{4\sqrt{3}}{15}\right)$ (B) $\cos^{-1}\left(\frac{\sqrt{3}}{5}\right)$

(C) $\cos^{-1}\left(\frac{2\sqrt{3}}{5}\right)$ (D) $\cos^{-1}\left(\frac{8\sqrt{3}}{15}\right)$

6) If a line has the direction ratios $-18, 12, -4$ then what are its direction cosines?

(A) $\frac{-9}{22}, \frac{6}{22}, \frac{-2}{22}$ (B) $-9, 6, -2$

(C) $\frac{-9}{11}, \frac{6}{11}, \frac{-2}{11}$ (D) $-18, 12, -4$

7) For linear programming problem, the objective function is $Z = px + qy,\ p, q > 0$. If at the corner points (0, 10) and (5, 5) the values of Z are 90 and 60 respectively, then relation between p and q is ______.

(A) $p = 2q$ (B) $q = 3p$

(C) $q = 2p$ (D) $p = 3q$

8) For linear programming problem, the objective function is $Z = -50x + 20y$. If the corner points of the bounded feasible region are (0, 5), (0, 3), (1, 0), (6, 0), then the minimum value of Z is ______.

(A) -500 (B) -200

(C) -300 (D) -100

Rough Work

9) If P(A) = 0.8, P(B) = 0.5 and P(B/A) = 0.4, then P(A/B) = ____.

(A) 0.40 (B) 0.32

(C) 0.64 (D) 0.16

10) Probability that A speaks truth is $\frac{4}{5}$. A coin is tossed. A reports that a head appears. The probability that actually there was head is ______.

(A) $\frac{2}{5}$ (B) $\frac{1}{2}$

(C) $\frac{1}{5}$ (D) $\frac{4}{5}$

11) Let R be the relation in the set N given by $R = \{(a, b) : a = b - 2, b > 6\}$. Choose the correct answer.

(A) $(8, 7) \in R$

(B) $(3, 8) \in R$

(C) $(6, 8) \in R$

(D) $(2, 4) \in R$

12) If $f(x) = (1 - x^3)^{\frac{1}{3}}$, then $f \circ f(x) =$ ______.

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

(C) $-x$ (D) x

Rough Work

13) The number of all onto functions from the set $\{1, 2, 3, 4, 5\}$ to itself is ______.

(A) 2^{25} (B) 2^5

(C) $5!$ (D) 5^2

14) $\sin^{-1}\left\{\cos\left(\sin^{-1}\frac{1}{2}\right)\right\} =$ ________.

(A) $-\frac{\pi}{3}$ (B) $\frac{\pi}{6}$

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

15) $\sin^{-1}(1-x) - 2\sin^{-1}x = \frac{\pi}{2}$, then x is equal to _______.

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

(C) 0 (D) $0, \frac{1}{2}$

16) $\tan^{-1}\left(\tan\left(\frac{13\pi}{6}\right)\right) + \cot^{-1}\left(\cot\left(\frac{7\pi}{3}\right)\right) =$ _______.

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{6}$

(C) 0 (D) $\frac{\pi}{3}$

Rough Work

17) $\sin\left(\frac{\pi}{3}-\sin^{-1}\left(-\frac{1}{2}\right)\right)=$ ______.

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

(C) $\frac{1}{4}$ (D) $\frac{1}{2}$

18) If $A=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 2 & 3 & -1\end{bmatrix}$, then A^2 is ______.

(A) $-A$ (B) I_3

(C) A (D) $[0]_{3\times3}$

19) If the matrix A is both symmetric and skew symmetric, then

(A) A is a diagonal matrix

(B) A is zero matrix

(C) A is square matrix

(D) None of these

20) If $A=\begin{bmatrix}\cos\alpha & -\sin\alpha\\ \sin\alpha & \cos\alpha\end{bmatrix}$ and $A+A'=I$, then the value of α is ______.

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

(C) π (D) $\frac{\pi}{6}$

Rough Work

21) X and Y are matrices of order $2 \times n$ and $2 \times p$ respectively. If $n=p$, then the order of the matrix $7X - 5Y$ is ______.

(A) $p \times n$ (B) $2 \times n$

(C) $n \times 3$ (D) $p \times 2$

22) If the area of triangle with vertices are $(-2, 0)$, $(0, 4)$ and $(0, k)$ is 4 sq. units, then values of k ______.

(A) -8 (B) $0, -8$

(C) $0, 8$ (D) None of these

23) If $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$, then $A^{-1} =$ ______.

(A) $\frac{1}{5}\begin{bmatrix} -4 & -3 \\ -1 & -2 \end{bmatrix}$ (B) $\frac{1}{5}\begin{bmatrix} 4 & -3 \\ -1 & 2 \end{bmatrix}$

(C) $\frac{1}{5}\begin{bmatrix} 4 & 3 \\ 1 & 2 \end{bmatrix}$ (D) $\frac{1}{5}\begin{bmatrix} -2 & 1 \\ 3 & -4 \end{bmatrix}$

24) If $A = \begin{bmatrix} 1 & \cancel{0} & 0 \\ 3 & 3 & 0 \\ 5 & 2 & -1 \end{bmatrix}$, then $|\text{adj } A| =$ ______.

(A) 9 (B) 3

(C) -9 (D) -3

Rough Work

25) Let $A=\begin{bmatrix}1 & \sin\theta & 1\\ -\sin\theta & 1 & \sin\theta\\ -1 & -\sin\theta & 1\end{bmatrix}$, where $0\le\theta\le 2\pi$, then

(A) $\det(A)\in[2,4]$
(B) $\det(A)\in(2,\infty)$
(C) $\det(A)\in(2,4)$
(D) $\det(A)=0$

26) $f(x)=\begin{cases}\dfrac{k\cos x}{3\pi-2x} & ;\ x\neq {}^{3\pi}\!/_2\\ 3 & ;\ x={}^{3\pi}\!/_2\end{cases}$ is continuous at $x=\dfrac{3\pi}{2}$, then $k=$ ________.

(A) -3
(B) -6
(C) 3
(D) 6

27) If $x=a(\theta-\sin\theta)$ and $y=a(1-\cos\theta)$, then $\dfrac{dy}{dx}=$ _____.

(A) $-\tan\left(\dfrac{\theta}{2}\right)$
(B) $\cot\left(\dfrac{\theta}{2}\right)$
(C) $\tan\left(\dfrac{\theta}{2}\right)$
(D) $-\cot\left(\dfrac{\theta}{2}\right)$

28) $\dfrac{d}{dx}\left(\sin\left(\log_7 x\right)\right)=$ _____; $(x>0)$

(A) $\dfrac{\cos(\log x)}{x}$

(B) $\dfrac{\cos(\log x)}{\log 7}$

(C) $\dfrac{\cos(\log_7 x)}{x\log 7}$

(D) $\dfrac{\cos(\log_7 x)}{x}$

Rough Work

29) The total revenue in Rupees received from the sale of x units of a product is given by $R(x) = 3x^2 + 36x + 5$. The marginal revenue, when $x = 10$ is ______.

(A) 126
(B) 96
(C) 90
(D) 116

30) The interval in which $y = x^2 \cdot e^{-x}$ is increasing is ———.

(A) $(0,2)$
(B) $(-2, 0)$
(C) $(2,\infty)$
(D) $(-\infty,\infty)$

31) For all real values of x, the minimum value of $\frac{1-x+x^2}{1+x+x^2}$ is ______.

(A) 3
(B) 1
(C) $\frac{1}{3}$
(D) 0

32) Each side of an equilateral triangle is increasing at the rate of 8 cm/hr. The rate of increase of its area when length of side is 2 cm is _______ cm^2/hr.

(A) $\frac{\sqrt{3}}{4}$
(B) $4\sqrt{3}$
(C) $\frac{\sqrt{3}}{8}$
(D) $8\sqrt{3}$

Rough Work

33) $\int \frac{x^9}{\left(4x^2+1\right)^6}dx =$ _____ $+ C.$

(A) $\frac{1}{10}\left(\frac{1}{x^2}+4\right)^{-5}$

(B) $\frac{1}{5}\left(4+\frac{1}{x^2}\right)^{-5}$

(C) $\frac{1}{10x}\left(\frac{1}{x^2}+4\right)^{-5}$

(D) $\frac{1}{5x}\left(4+\frac{1}{x^2}\right)^{-5}$

34) $\int \frac{\sin^{24} x}{\cos^{26} x}dx =$ _____ $+ C.$

(A) $\frac{\tan^{27} x}{27}$

(B) $\frac{\tan^{25} x}{25}$

(C) $\frac{\tan^{26} x}{26}$

(D) $\frac{\tan^{24} x}{24}$

D 35) $\int \frac{\sin x}{3+4\cos^2 x}dx =$ _____ $+ C.$

(A) $\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{2\cos x}{\sqrt{3}}\right)$

(B) $-\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{\cos x}{\sqrt{3}}\right)$

(C) $\frac{1}{2\sqrt{3}}\tan^{-1}\left(\frac{\sqrt{3}\sec x}{2}\right)$

(D) $\log\left(3+4\cos^2 x\right)$

Rough Work

36) $\int \frac{e^x(1+x)}{\cos^2(x \cdot e^x)} dx =$ _____ $+ C$.

(A) $\cot(e^x)$

(B) $\tan(x \cdot e^x)$

(C) $\tan(e^x)$

(D) $-\cot(x \cdot e^x)$

37) If f is continuous and even function on $[-a, a]$ and $\int_{-a}^{a} f(x)dx = 2026$, then $\int_{-a}^{0} f(x)dx =$ _____.

(A) 2026

(B) 1023

(C) 0

(D) 1013

38) $\int_0^{\frac{\pi}{2}} \log\left(\frac{4+3\sin x}{4+3\cos x}\right) dx =$ _______.

(A) -2

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

(C) 0

(D) 2

39) $\int \frac{dx}{e^x + e^{-x}} =$ _____ $+ C$.

(A) $\log(e^x + e^{-x})$

(B) $\tan^{-1}(e^{-x})$

(C) $\log(e^x - e^{-x})$

(D) $\tan^{-1}(e^x)$

Rough Work

40) $\int (x+1)e^x dx =$ _____ $+ C$.

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

(B) $x e^x$

(C) x

(D) e^x

41) Area lying in the first quadrant and bounded by the circle $x^2 + y^2 = 4$ and the lines $x = 0$ and $x = 2$ is ________.

(A) $\frac{\pi}{4}$

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

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

(D) π

42) The area bounded by the curve $y = \sin x$ between $x = -\frac{\pi}{2}$ and $x = \frac{\pi}{2}$.

(A) 3

(B) 1

(C) 2

(D) 0

43) Area bounded by the curve $y = x^3$, the X - axis and the ordinates $x = -2$ and $x = 1$ is _______.

(A) $\frac{17}{4}$

(B) $-\frac{15}{4}$

(C) $\frac{15}{4}$

(D) -9

Rough Work

44) The order of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^3+\left(\frac{dy}{dx}\right)^2+\cos\left(\frac{dy}{dx}\right)+1=0 \text{ is } \_\_\_\_\_\_.$$

(A) 3 ~~(B)~~ 2

(C) 1 (D) not defined

45) A homogeneous differential equation of the form $\frac{dx}{dy}=h\left(\frac{x}{y}\right)$ can be solved by making the substitution ______.

(A) $x=v$ (B) $v=yx$

~~(C)~~ $x=vy$ (D) $y=vx$

46) The Integrating Factor of the differential equation $\left(1-y^2\right)\frac{dx}{dy}+yx=ay,\ (-1<y<1)$ is ______.

~~(A)~~ $\frac{1}{\sqrt{1-y^2}}$ (B) $\frac{1}{\sqrt{y^2-1}}$

(C) $\frac{1}{1-y^2}$ (D) $\frac{1}{y^2-1}$

47) The general solution of the differential equation $\frac{dy}{dx}=e^{x-y}$ is ______.

(A) $e^{-x}+e^{y}=C$ (B) $e^{y}+e^{x}=C$

(C) $e^{x}+e^{-y}=C$ ~~(D)~~ $e^{y}-e^{x}=C$

Rough Work

48) If $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then angle between $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ is ______.

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

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

(C) π

(D) 0

49) Find the projection of the vector $\vec{a} = 2\hat{i} + 3\hat{j} + 2\hat{k}$ on the vector $\vec{b} = \hat{i} + 2\hat{j} + \hat{k}$.

(A) $\frac{5\sqrt{6}}{3}$

(B) $\frac{5\sqrt{3}}{2}$

(C) $\frac{5\sqrt{2}}{3}$

(D) $\frac{3\sqrt{6}}{5}$

50) If $\vec{a}$ is a nonzero vector of magnitude 'a' and λ is a nonzero scalar, then $\lambda\vec{a}$ is unit vector if

(A) $\lambda = 1$

(B) $\lambda = -1$

(C) $a = |\lambda|$

(D) $a = \frac{1}{|\lambda|}$

050 (E)

(FEBRUARY-MARCH, 2025)
(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 27 questions are there.
3) All 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.
8) Use the graph paper to solve the problem of L.P.

SECTION - A

■ **From the following question no. 1 to 12 answer any 8 questions as directed. (Each carries 2 marks)** **[16]**

1) Prove that : $\cos^{-1}\frac{12}{13}+\sin^{-1}\frac{3}{5}=\sin^{-1}\frac{56}{65}$. [2]

2) Prove that : $\tan^{-1}\left(\frac{\sqrt{1+x}-\sqrt{1-x}}{\sqrt{1+x}+\sqrt{1-x}}\right)=\frac{\pi}{4}-\frac{1}{2}\cos^{-1}x;\ -\frac{1}{\sqrt{2}}\le x\le 1$. [2]

3) Find $\frac{dy}{dx}$ if $\sin^2 y+\cos(xy)=k$. [2]

4) Find $\int\frac{dx}{1+\sqrt{x}}$. [2]

5) Find the area of the region bounded by the ellipse $\frac{x^2}{4}+\frac{y^2}{9}=1$. [2]

6) Sketch the graph of $y=|x+2|$ and evaluate $\int_{-4}^{0}|x+2|\,dx$. [2]

7) For the differential equation $xy\frac{dy}{dx}=(x+2)(y+2)$, find the solution curve passing through the point $(1,-1)$. [2]

8) If $\vec{a}=\hat{i}+\hat{j}+\hat{k}$, $\vec{b}=2\hat{i}-\hat{j}+3\hat{k}$ and $\vec{c}=\hat{i}-2\hat{j}+\hat{k}$, find a unit vector parallel to the vector $2\vec{a}-\vec{b}+3\vec{c}$. [2]

9) Find the distance between the lines l_1 and l_2 given by $\vec{r}=\hat{i}+2\hat{j}-4\hat{k}+\lambda(2\hat{i}+3\hat{j}+6\hat{k})$ and $\vec{r}=3\hat{i}+3\hat{j}-5\hat{k}+\mu(2\hat{i}+3\hat{j}+6\hat{k})$. [2]

10) Find the vector equation of the line passing through the point $(1, 2, -4)$ and perpendicular to the two lines $\frac{x-8}{3}=\frac{y+19}{-16}=\frac{z-10}{7}$ and $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$. [2]

11) An unbiased die is thrown twice. Let the event A be 'odd number on the first throw' and B the event 'odd number on the second throw'. Check the independence of the events A and B. [2]

12) If a leap year is selected at random, what is the chance that it will contain 53 Tuesdays? [2]

SECTION - B

■ **From the following question no. 13 to 21 answer any 6 questions as directed. (Each carries 3 marks)** **[18]**

13) Let $A = R - \{-1\}$ and $B = R - \{1\}$. Consider the function $f : A \rightarrow B$ defined by $f(x) = \dfrac{x-1}{x+1}$. Is f one-one and onto? Justify your answer. [3]

14) Express the matrix $\begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix. [3]

15) If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$, then verify that $(AB)^{-1} = B^{-1}A^{-1}$. [3]

16) If $2x = y^{\frac{1}{m}} + y^{-\frac{1}{m}}$; $(m \in R,\ m > 1)$, then prove that $(x^2-1)y_2 + xy_1 = m^2 y$. [3]

17) Find the intervals in which the function f given by $f(x) = 2x^3 - 3x^2 - 36x + 7$ is [3]
   a) Increasing
   b) Decreasing

18) Let $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$ and $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$. Find a vector $\vec{d}$ which is perpendicular to both $\vec{a}$ and $\vec{b}$ and $\vec{c} \cdot \vec{d} = 15$. [3]

19) Find the shortest distance between the lines whose vector equations are $\vec{r} = (1-t)\hat{i} + (t-2)\hat{j} + (3-2t)\hat{k}$ and $\vec{r} = (s+1)\hat{i} + (2s-1)\hat{j} - (2s+1)\hat{k}$. [3]

20) Solve the following linear programming problems graphically : [3]
Minimise $Z = 3x + 5y$
Such that $x + 3y \geq 3$, $x + y \geq 2$, $x, y \geq 0$.

21) Given three identical boxes I, II and III, each containing two coins. In box I, both coins are gold coins, in box II, both are silver coins and in the box III, there is one gold and one silver coin. A person chooses a box at random and takes out a coin. If the coin is of gold, what is the probability that the other coin in the box is also of gold? [3]

SECTION - C

- **From the following question no. 22 to 27 answer any 4 questions as directed. (Each carries 4 marks)** **[16]**

22) For the matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ show that $A^3 - 6A^2 + 5A + 11\,I = O$. Hence, find A^{-1}. **[4]**

23) Solve system of linear equations, using matrix method. **[4]**

$x - y + 2z = 7$

$3x + 4y - 5z = -5$

$2x - y + 3z = 12$

24) If $(x - a)^2 + (y - b)^2 = c^2$, for some $c > 0$, prove that $\dfrac{\left[1 + \left(\dfrac{dy}{dx}\right)^2\right]^{3/2}}{\dfrac{d^2y}{dx^2}}$ is a constant independent of a and b. **[4]**

25) Show that the right circular cone of least curved surface and given volume has an altitude equal to $\sqrt{2}$ times the radius of the base. **[4]**

26) Find $\int \dfrac{x^4}{(x-1)(x^2+1)}\,dx$. **[4]**

27) In a bank, principal increases continuously at the rate of 5% per year. An amount of Rs. 1,000 is deposited with this bank, how much will it worth after 10 years? ($e^{0.5} = 1.648$) **[4]**