This Question Paper contains 20 printed pages
(Part - A & Part - B)
Sl.No. 1700926

050 (E)

(MARCH, 2023)
(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.

05

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) For square matrix A if $A = B + \frac{C}{2}$, where B is skew symmetric matrix and C is symmetric matrix, then C = _____.

(A) $A + A'$ (B) $\frac{A + A'}{2}$

(C) $A - A'$ (D) $\frac{A - A'}{2}$

2) For determinant A, if $A = \begin{vmatrix} 1 & 2 & 13 \\ 3 & 0 & 5 \\ 6 & 7 & 11 \end{vmatrix}$ and p, q and r are cofactors of 13, 5 and 11 respectively, then $p + 3q + 6r =$ ______.

(A) 232 (B) 241

(C) 0 (D) 243

3) Let A be a nonsingular square matrix of order 3 × 3. Then $|\text{adj } A| =$ __________.

(A) $|A|$ (B) $|A|^3$

(C) $|A|^2$ (D) $3|A|$

4) If area of triangle is 35 sq. units with vertices (2, –6), (5, 4) and $(k, 4)$, then $k =$ ________.

(A) 12 (B) –12, –2

(C) –2 (D) 12, –2

5) $f(x) = \begin{cases} \dfrac{k \cos x}{\pi - 2x}, & \text{if } x \neq \dfrac{\pi}{2} \\ 3, & \text{if } x = \dfrac{\pi}{2} \end{cases}$ is continuous function at $x = \dfrac{\pi}{2}$ then $k =$ ________.

(A) 6 (B) –6

(C) 3 (D) –3

$y = 5$

6) If $y = 5\cos x - 3\sin x$, then $\frac{d^2y}{dx^2} =$ ________.

(A) 0

(B) y

(C) $-y$

(D) $-\frac{dy}{dx}$

7) If $x = a(\theta + \sin\theta)$, $y = a(1 - \cos\theta)$, then $\frac{dy}{dx} =$ ________.

(A) $\cot\frac{\theta}{2}$

(B) $\tan\frac{\theta}{2}$

(C) $\frac{1}{2}\cot\frac{\theta}{2}$

(D) $\frac{1}{2}\tan\theta$

8) The rate of change of the area of a circle with respect to its radius r at $r = 6$ cm is ________.

(A) 10π

(B) 8π

(C) 12π

(D) 11π

9) The interval in which $y = x^2 e^{-x}$ is increasing is ________.

(A) $(-\infty, \infty)$

(B) $(2, \infty)$

(C) $(-2, 0)$

(D) $(0, 2)$

10) The slope of the normal to the curve $y = 2x^2 + 3\sin x$ at $x = 0$ is ________.

(A) 3

(B) -3

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

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

11) The maximum value of $\left[x(x-1)+1\right]^{\frac{1}{3}}$, $0 \le x \le 1$ is ______.

$u =$

(A) $\left(\frac{1}{3}\right)^{\frac{1}{3}}$ (B) 1

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

12) $\int \frac{1}{x + x\log x} dx =$ ________ + C.

(A) $\frac{-1}{(1+\log x)^2}$ (B) $1 + \log x$

(C) $\log|\log(ex)|$ (D) $\frac{\log x}{x}$

13) $\int \frac{dx}{\sqrt{2x - x^2}} =$ ________ + C.

$\frac{1}{\sqrt{1-1+2x-x^2}}$

(A) $\log\left|x - 1 + \sqrt{2x - x^2}\right|$

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

$(x-1)$

(B) $\sin^{-1}(x-1)$

$\sin^{-1}\frac{(x-1)}{1}$

(C) $\log\left|\frac{x}{2-x}\right|$

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

14) $\int \frac{(x-3)e^x}{(x-1)^3}dx =$ ________ + C.

(A) $\frac{e^x}{(x-1)^3}$

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

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

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

$LT = \frac{MT^2}{4FT} = \frac{64x^2}{4x^2}$ 16

15) $\int \sqrt{x^2-8x+7}\,dx =$ ________ + C.

$x^2-8x+16+7-16$

$(x-4)^2 - 9(3)^2$

(A) $\frac{1}{2}(x-4)\sqrt{x^2-8x+7}+9\log\left|x-4+\sqrt{x^2-8x+7}\right|$

(B) $\frac{1}{2}(x-4)\sqrt{x^2-8x+7}-3\sqrt{2}\log\left|x-4+\sqrt{x^2-8x+7}\right|$

(C) $\frac{1}{2}(x+4)\sqrt{x^2-8x+7}+9\log\left|x+4+\sqrt{x^2-8x+7}\right|$

(D) $\frac{1}{2}(x-4)\sqrt{x^2-8x+7}-\frac{9}{2}\log\left|x-4+\sqrt{x^2-8x+7}\right|$

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

e^0

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

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

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

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

17) If $f(a+b-x)=f(x)$, then $\int_a^b x f(x)\,dx =$ ______.

$\int x f(x)$

(A) $\frac{a+b}{2}\int_a^b f(x)\,dx$

(B) $\frac{b-a}{2}\int_a^b f(x)\,dx$

(C) $\frac{a+b}{2}\int_a^b f(b+x)\,dx$

(D) $\frac{a+b}{2}\int_a^b f(b-x)\,dx$

18) $\int_0^1 x(1-x)^n\,dx =$ ______.

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

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

(C) $\frac{1}{n^2+3n+2}$

(D) $\frac{1}{n^2+3n-2}$

19) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \left(x^3 + x\cos x + \tan^5 x + 1\right)dx =$ ______.

(A) π

(B) 1

(C) 0

(D) 2

20) Area lying between the curves $y^2 = 4x$ and $y = 2x$ is ______.

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

(B) $\frac{1}{4}$

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

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

21) The area of the region bounded by the ellipse $\frac{x^2}{16}+\frac{y^2}{9}=1$ is __________ sq. unit.

(A) 144π

(B) 12

(C) 12π

(D) $\frac{16\pi}{9}$

22) The area bounded by the curve $y = \cos x$ between $x = 0$ and $x=\frac{3\pi}{2}$ is __________ sq. unit.

(A) 1

(B) 3

(C) 2

(D) 4

23) The order and degree of the differential equation

$$\left(\frac{d^2y}{dx^2}\right)^3+\left(\frac{dy}{dx}\right)^2+\sin\left(\frac{dy}{dx}\right)+1=0$$

are ________ and ________ respectively.

(A) 2, 3

(B) 2, not defined

(C) 3, 2

(D) not defined, 2

24) The number of arbitrary constants in the particular solution of a differential equation of third order are ________.

(A) 3

(B) 1

(C) 2

(D) 0

$x^{3/2}+x^2$
$+1=4$

25) The general solution of the differential equation $\frac{y\,dx - x\,dy}{y} = 0$ is ________.

$\frac{y}{y} dx - \frac{x}{y} dy \; \frac{y}{=0}$

(A) $xy = c$

(B) $y = cx$

$dx = \frac{x}{y} dy$

(C) $x = cy^2$

(D) $y = cx^2$

$\log x = \log y + C$

$\log x = \log cy$

26) The area of a triangle having the points A (1, 1, 1), B (1, 2, 3) and C (2, 3, 1) as its vertices is ________.

(A) $\frac{\sqrt{21}}{2}$

(B) $2\sqrt{21}$

(C) $\sqrt{21}$

(D) $\frac{21}{2}$

27) For the vectors $\vec{a}$ and $\vec{b}$, if $|\vec{a}| = 3$ and $|\vec{b}| = \frac{\sqrt{2}}{3}$ and $\vec{a} \times \vec{b}$ is unit vector, then the angle between $\vec{a}$ and $\vec{b}$ is ______.

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

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

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

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

28) The value of $\hat{k}\cdot(\hat{i}\times\hat{j}) + \hat{j}\cdot(\hat{i}\times\hat{k}) + \hat{i}\cdot(\hat{j}\times\hat{k})$ is ______.

(A) 3

(B) −1

(C) 1

(D) 0

29) For vectors $\vec{a}, \vec{b}, \vec{c}$, if $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $|\vec{a}|=2, |\vec{b}|=3, |\vec{c}|=5$ then $\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a}=$ ________.

(A) 0
(B) −19
(C) 1
(D) 38

30) If the vectors $\vec{a}=\hat{i}+3\hat{j}+\hat{k}$, $\vec{b}=2\hat{i}-\hat{j}-\hat{k}$ and $\vec{c}=\lambda\hat{i}+7\hat{j}+3\hat{k}$ are coplanar then $\lambda=$ ________.

(A) 0
(B) 3
(C) −3
(D) 5

31) For any vectors $\vec{a}$ and $\vec{b}$, we always have $|\vec{a}||\vec{b}|$ ________ $|\vec{a}\cdot\vec{b}|$.

(A) $\geq$
(B) $\leq$
(C) $>$
(D) $<$

32) Distance between the two planes $2x + 3y + 4z = 4$ and $4x + 6y + 8z = 12$ is ________ units.

(A) 2
(B) 8
(C) 4
(D) $\frac{2}{\sqrt{29}}$

33) The angle between the line $\frac{x+1}{2}=\frac{y}{3}=\frac{z-3}{6}$ and the plane $10x+2y-11z=3$ is ________.

(A) $\cos^{-1}\left(\frac{8}{21}\right)$
(B) $\sin^{-1}\left(\frac{8}{21}\right)$
(C) $\cos^{-1}\left(\frac{8}{\sqrt{21}}\right)$
(D) $\sin^{-1}\left(\frac{8}{\sqrt{21}}\right)$

34) The direction cosines of the normal to the plane $5y + 8 = 0$ are ________.

(A) 5, 8, 0

(B) 0, 1, 0

(C) 25, 64, 0

(D) 0, 5, 0

35) The corner points of the feasible region determined by the following system of linear inequalities : $2x + y \leq 10$, $x + 3y \leq 15$, $x, y \geq 0$ are (0, 0), (5, 0), (3, 4) and (0, 5). Let $Z = px + qy$, where $p, q > 0$, condition on p and q so that the maximum of Z occurs at both (3, 4) and (0, 5) is ________.

(A) $p = q$

(B) $p = 3q$

(C) $p = 2q$

(D) $q = 3p$

36) For linear programming problem the objective function $Z = 10500\,x + 9000\,y$, if the corner points of the bounded feasible region are (0, 0), (40, 0), (30, 20) and (0, 50), then the maximum value of Z is ________.

(A) 5,95,000

(B) 4,95,000

(C) 6,20,000

(D) 4,50,000

37) For linear programming problem the objective function $Z = 8000\,x + 12000\,y$, if the corner points of the feasible region are (0, 0), (20, 0), (12, 6) and (0, 10), then maximum value of Z occur at ________ corner point.

(A) (0, 0)

(B) (12, 6)

(C) (20, 0)

(D) (0, 10)

38) Two events A and B will be independent, if ________.

(A) A and B are mutually exclusive

(B) $P(A) = P(B)$

(C) $P(A' \cap B') = [1 - P(A)][1 - P(B)]$

(D) $P(A) + P(B) = 1$

39) If A and B are two events such that $P(A) \neq 0$ and $P(B/A) = 1$, then ________.

(A) $A \subset B$

(B) $B = \varnothing$

(C) $B \subset A$

(D) $A = \varnothing$

40) In a box containing 100 bulbs, 10 are defective. The probability that out of a sample of 5 bulbs, none is defective is ________.

100 10

(A) 10^{-1}

5 $\frac{5}{90}$

(B) $\left(\frac{9}{10}\right)^5$

(C) $\left(\frac{1}{2}\right)^5$

(D) $\frac{9}{10}$

41) Let R be the relation in the set N given by

$R = \{(a, b) : a = b - 2, b > 6\}$. Then choose the correct option from the following.

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

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

~~(C)~~ $(3, 8) \in R$

~~(D)~~ $(6, 8) \in R$

42) If $f : R \to R$ be given by $f(x) = (3 - x^5)^{\frac{1}{5}}$, then $(f \circ f)(x)$ = ________.

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

~~(B)~~ x

(C) x^5

(D) $3 - x^5$

43) Number of binary operations on the set $\{3, 5\}$ are ________.

(A) 8

(B) 15

~~(C)~~ 10

(D) 16

Rough Work

44) $\cot^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right) =$ _______ where $x > 1$.

(A) $\sec^{-1}x$

(B) $\sin^{-1}x$

(C) $\text{cosec}^{-1}x$

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

45) $\tan^{-1}\sqrt{3} - \cot^{-1}(-\sqrt{3}) =$ _____.

(A) π

(B) 0

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

(D) $2\sqrt{3}$

46) $\sin^{-1}\frac{x}{5} + \sin^{-1}\frac{4}{5} = \frac{\pi}{2}$, then $x =$ _______.

(A) 3

(B) $\frac{25}{4}$

(C) 4

(D) $\frac{25}{3}$

47) $\sin^{-1}(1-x)-2\sin^{-1}x=\frac{\pi}{2}$, then $x=$ ________.

(A) $0,\frac{1}{2}$

(B) 0

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

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

48) Total number of possible matrices of order 3×3 with each entry 2 or 9 is ________.

(A) 27

(B) 81

(C) 18

(D) 512

49) If A, B are symmetric matrices of same order, then AB–BA is ________.

(A) a skew symmetric matrix

(B) a zero matrix

(C) a symmetric matrix

(D) an identity matrix

50) If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ = ________.

(A) A

(B) I

(C) I–A

(D) 3A

050 (E)

(MARCH, 2023)
(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 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

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

1) Express $\tan^{-1}\left(\frac{\cos x}{1-\sin x}\right), -\frac{3\pi}{2}<x<\frac{\pi}{2}$ in the simplest form. [2]

2) If $y=3\cos(\log x)+4\sin(\log x)$, then prove that $x^2y_2+xy_1+y=0$. [2]

3) Find $\int\frac{\tan^4\sqrt{x}\sec^2\sqrt{x}}{\sqrt{x}}dx$. [2]

4) Find the area of the smaller part of the circle $x^2+y^2=a^2$ cut off by the line $x=\frac{a}{\sqrt{2}}$. [2]

OR

4) Find the area of the region bounded by the parabola $y=x^2$ and $y=|x|$. [2]

5) If $\vec{a} = 5\hat{i} - \hat{j} - 3\hat{k}$ and $\vec{b} = \hat{i} + 3\hat{j} - 5\hat{k}$, then show that the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ are perpendicular. [2]

6) Prove that if a plane has the intercepts a, b, c and is at a distance of p units from the origin, then $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2} = \frac{1}{p^2}$. [2]

7) Find the area of the region bounded by the lines $y = 3x + 2, x = -1, x = 1$ and the X-axis. [2]

8) Given that the events A and B are such that $P(A) = \frac{1}{2}, P(A \cup B) = \frac{3}{5}$ and $P(B) = p$. Find p if they are [2]
   i) mutually exclusive
   ii) independent

SECTION - B

■ **Answer the following 9 to 14 questions as directed in the question. (Each question carries 3 marks)** **[18]**

9) $A = R - \{3\}$, $B = R - \{1\}$ consider the function $f : A \to B$ defined by $f(x) = \frac{x-2}{x-3}$. Is f bijective? If yes then find Inverse function of f. [3]

10) If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, prove that $A^3 - 6A^2 + 7A + 2I = 0$. [3]

OR

10) Obtain the Inverse of the matrix $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ by using elementary operations. [3]

11) If $x\sqrt{1+y}+y\sqrt{1+x}=0$, for $-1<x<1$, prove that $\frac{dy}{dx}=-\frac{1}{(1+x)^2}$. [3]

12) 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 $\frac{x-15}{3}=\frac{y-29}{8}=\frac{z-5}{-5}$. [3]

OR

12) Find the equation of the plane which contains the line of intersection of the planes $x+2y+3z-4=0$, $2x+y-z+5=0$ and which is perpendicular to the plane $5x+3y-6z+8=0$. [3]

13) Solve the following linear programming problem graphically.
Minimise and Maximise $Z=3x+9y$
Subject to constraints : $x+3y\le 60$, $x+y\ge 10$, $x\le y$, $x\ge 0$, $y\ge 0$. [3]

14) The probability of a shooter hitting a target is $\frac{3}{4}$. How many minimum number of times must he/she fire so that the probability of hitting the target at least once is more than 0.99? [3]

SECTION - C

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

15) Prove that

$$\begin{vmatrix} (y+z)^2 & xy & zx \\ xy & (x+z)^2 & yz \\ xz & yz & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3$$ [4]

16) Find the intervals in which the function f given by **[4]**

$0 \quad \pi/6 \quad \pi/4 \quad \pi/3 \quad \pi/2 \qquad 1/c$

$$f(x)=\frac{4\sin x-2x-x\cos x}{2+\cos x} \text{ is}$$

i) increasing

ii) decreasing

OR

16) Show that the semi-vertical angle of the cone of the maximum volume and of given slant height (l) is $\tan^{-1}\sqrt{2}$. **[4]**

17) Evaluate $\int_0^{\pi}\frac{x\tan x}{\sec x+\tan x}dx$. **[4]**

18) Find a particular solution of the differential equation $\frac{dy}{dx}+y\cot x=4x\operatorname{cosec} x$ $(x\neq 0)$ given that $y=0$ when $x=\frac{\pi}{2}$. **[4]**

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