ıuestion Paper contains 20 printed pages.
·A & Part - B)
ɔ. 0100754

050 (E)

(MARCH, 2020)
SCIENCE STREAM
(CLASS - XII)
(New Course)

A : Time : 1 Hour / Marks : 50
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.

01

(Part - A)

: 1 Hour] [Maximum Marks : 50

ıctions :

l) There are 50 objective type (M.C.Q.) questions in Part - A and all questions are compulsory.

!) The questions are serially numbered from 1 to 50 and each carries 1 mark.

ı) Read each question carefully, select proper alternative and answer in the O.M.R. sheet.

l) 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.

;) Rough work is to be done in the space provided for this purpose in the Test Booklet only.

ı) 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.

) Use of simple calculator and log table is allowed, if required.

) Notations used in this question paper have proper meaning.

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

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

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

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

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

Rough Work

$a = b - 2$

$a = b - 2$

2<4

Eg 3 = 5

6 = 8

Rough W

2) $a * b = \frac{ab}{10}$ defined on Q. Inverse of 0.001 is ________

(A) 100000

(B) 10000

(C) 1000000

(D) 1000

3) For sets S = {π, π^2, π^3} and T = { e, e^2, e^3}, if F^{-1} : T → S is defined as F^{-1} = {(e, π^3), (e^2, π^2), (e^3, π)}, then function F = ________

(A) {(π^3, e), (π^2, e^2), (π, e^3)}

(B) {(π, e^2), (π^3, e), (π^2, e^3)}

(C) {(e^2, π), (e^3, π^2), (e, π^3)}

(D) {(π, e), (π^2, e^2), (π^3, e^3)}

4) $\sum_{i=0}^{2} \cot^{-1}\{-(i+1)\}$ = ________

$\cot^{-1}(-1) + \cot^{-1}(-2) + \cot^{-1}(-3)$

(A) $\pi/2$

(B) $-3\pi/2$

(C) $-5\pi/2$

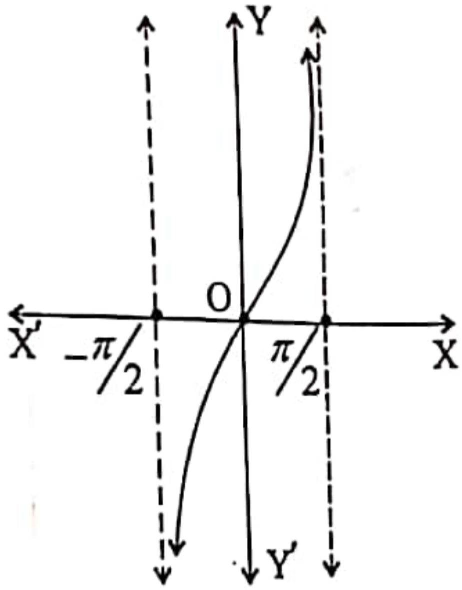
(D) $5\pi/2$

i) Which of the following is a graph of $f(x) = \tan^{-1}x$, $(x \in R)$?

Rough Work

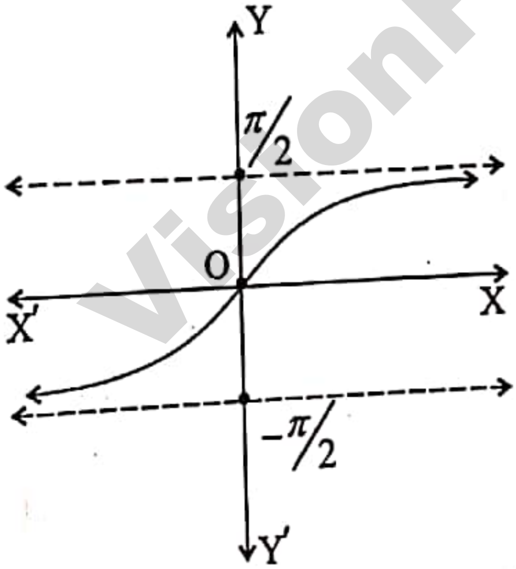
$y = \tan^{-1}(x)$

(A)



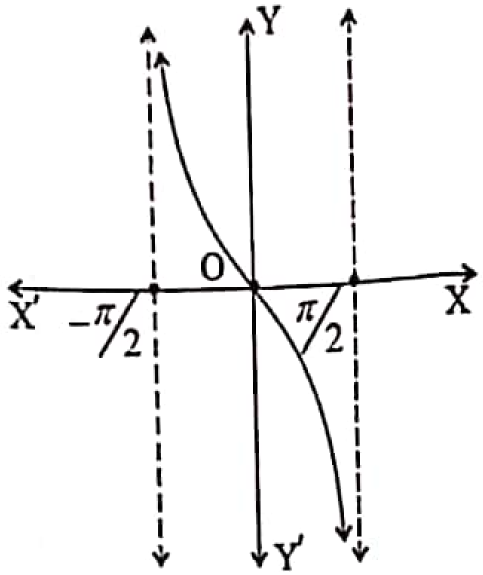
X

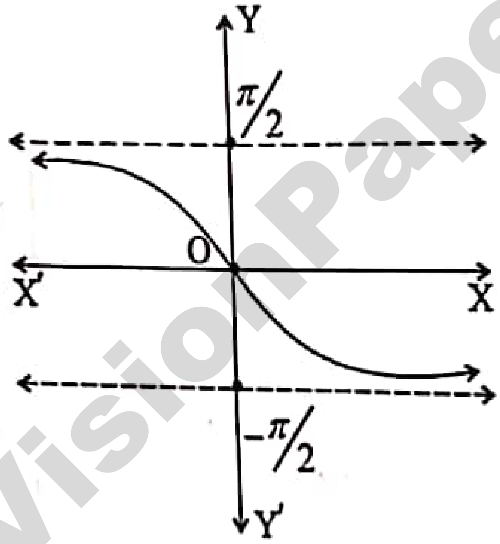
(B)



(P.T.O.)

Rough W

(C) 

(D) 

$\pi/2 + \pi/2 = \pi$

6) $\sec^{-1}x + \operatorname{cosec}^{-1}x + \cos^{-1}(x^{-1}) + \sin^{-1}(x^{-1}) =$ ______ (where $|x| \geq 1, x \in R$).

(A) $\pi/2$

(B) $3\pi/2$

(C) π

(D) 0

7) $\cot\left\{\frac{2019\pi}{2}-\left(\text{cosec}^{-1}\,{}^{5}\!/_{3}+\tan^{-1}\,{}^{2}\!/_{3}\right)\right\}$ = ______

(A) $-{}^{17}\!/_{6}$ (B) ${}^{19}\!/_{6}$

(C) ${}^{17}\!/_{6}$ (D) $-{}^{19}\!/_{6}$

8) For a 3×4 matrix, elements are given by $a_{ij} = |-3i+4j|$, then $\sum_{i=1}^{3}(a_{ii})^{i}$ = ______

(A) 3^3 (B) 4^3

(C) 2^5 (D) 6^3

9) A is 3×3 matrix and det(A) = 7. If B = adj A then det(AB) = ______

(A) 7^5 (B) 7^2

(C) 7 (D) 7^3

10) If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $A^2 - 5A = kI$ then k =

(A) −7 (B) 7

(C) 5 (D) −5

11) Matrices X and Y are inverse of each other then ______.

(A) XY=YX=0 (B) XY=YX=−I

(C) XY=I, YX=−I (D) $X^{-1}Y^{-1}=Y^{-1}X^{-1}=I$

Rough Work

Rough Work

12) If $\Delta = \begin{vmatrix} x+y+z^2 & x^2+y+z & x+y^2+z \\ z^2 & x^2 & y^2 \\ x+y & y+z & x+z \end{vmatrix}$, (where $(x \neq y \neq z)$ $x, y, z \in R - \{0\}$) then $\Delta =$ ________.

(A) $x+y+z$ (B) 1

(C) 0 (D) $x^2+y^2+z^2$

13) For $\Delta = \begin{vmatrix} 2019 & 2020 & 2021 \\ 2022 & 2023 & 2024 \\ 2025 & 2026 & 2027 \end{vmatrix}$ sum of minor and cofactor of 2020 is ________.

(A) 2020 (B) 0

(C) 4040 (D) -2020

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

(A) 1.2 (B) -20

(C) $-12, -2$ (D) $12, -2$

15) Let the function f be defined by

$$f(x) = \begin{cases} cx+1, & \text{if } x \leq 3 \\ dx+3, & \text{if } x > 3 \end{cases}$$

If f is continuous at $x = 3$, then $d - c =$ ________

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

(C) $-\frac{3}{2}$ (D) $\frac{2}{3}$

Rough Work

16) If $y=(x+3)^2\cdot(x+4)^3\cdot(x+5)^4$, then first order derivative of y with respect to x is ________.

(A) $\dfrac{y}{x}\displaystyle\sum_{i=2}^{4}\frac{i}{(x+1-i)}$

(B) $\dfrac{x}{y}\displaystyle\sum_{i=1}^{3}\frac{i+1}{(x+1+i)}$

(C) $\dfrac{1}{y}\displaystyle\sum_{i=1}^{3}\frac{i-1}{(x+1-i)}$

(D) $y\displaystyle\sum_{i=2}^{4}\left(\frac{i}{(x+1)+i}\right)$

17) If $y=\log_e(\log_\pi x)$, then $\dfrac{d^2y}{dx^2}=$ ________ (where $x>1$).

(A) $-\dfrac{\log_e(ex)}{(x\cdot\log_e x)^2}$

(B) $\dfrac{\log_e(ex)}{(x\cdot\log_e x)^2}$

(C) $-\dfrac{(x\cdot\log_e x)^2}{\log_e(ex)}$

(D) $\dfrac{\log_e\left(\frac{e}{x}\right)}{(x\cdot\log_\pi x)^2}$

18) At which point the slope of the normal to the curve $y=\sqrt{4x-3}-1$ is $\dfrac{2}{3}$?

(A) $(3, 2)$

(B) $\left(\dfrac{43}{36},\dfrac{1}{3}\right)$

(C) $\left(\dfrac{43}{16},-\dfrac{7}{8}\right)$

(D) $(2, 3)$

$y=\sqrt{\frac{43}{9}-3}-1$

$=\sqrt{\frac{16}{9}}-1$

$=\frac{4}{3}-1$

$=\frac{1}{3}$

$y'=\frac{1}{2\sqrt{4x-3}}(4)$

$=\frac{2}{\sqrt{4x-3}}$

$-\frac{\sqrt{4x-3}}{2}=\frac{2}{3}$

$y'=\frac{1}{2\sqrt{4x-3}}(4)$

$y'_{N}=-\frac{\sqrt{4x-3}}{2}$

$4x-3=\frac{16}{9}$

$x=\frac{43}{36}$

19) Approximate value of $\sqrt{0.081}=$ ________.

(A) 0.2867

(B) 0.2850

(C) 0.2866

(D) 0.2845

(P.T.O.)

Rough Work

20) Function $f(x)=|\sin x|, x\in\left(-\frac{\pi}{2},0\right)$ is :

(A) Strictly increasing

(B) Neither increasing nor decreasing

(C) Only an increasing

(D) Strictly decreasing

21) Local maximum value of the $f(x)=x+\frac{1}{x},(x\neq 0)$ is ________.

(A) 2 (B) -2

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

22) $\int\sqrt{\frac{\cos x-\cos^3 x}{1-\cos^3 x}}dx=$ ________ + C.

$\left(\text{where } x\in R-\left\{\frac{k\pi}{2}\Big/k\in Z\right\}\right)$

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

(C) $\frac{2}{3}\cos^{-1}\left(\sin^{3/2}x\right)$ (D) $\frac{2}{3}\sin^{-1}\left(\sin^{3/2}x\right)$

23) If $\int\frac{1}{e^x+1}dx=px-q\log|1+e^x|+C$ then $p+q=$ ________.

(A) -2 (B) 2

(C) 0 (D) 1

Rough Work

24) $\int e^{x^3} \cdot 5^{x^2} \cdot x \cdot [\log 25 + 3x] dx =$ ______ + C.

(A) $\frac{1}{6} \cdot e^{x^3} \cdot 5^{x^2} \cdot x$

(B) $\frac{1}{6} \cdot e^{x^3} \cdot 5^{x^2}$

(C) $e^{x^3} \cdot 5^{x^2} \cdot x$

(D) $e^{x^3} \cdot 5^{x^2}$

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

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

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

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

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

26) $\int_{-1}^{\sqrt{3}} \frac{dx}{1+x^2} =$ ______.

(A) $\frac{\pi}{12}$

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

(C) $\frac{7\pi}{12}$

(D) $\frac{5\pi}{12}$

27) $\int_0^{\pi} \cos^3 x \cdot \sin^4 x \, dx =$ ______.

(A) π

(B) 0

(C) $-\pi$

(D) 2π

Rough Work

28) $\int_{-\pi/6}^{\pi/6} \sin^5 x \cos^2 x \, dx =$ ______

(A) $\left(\frac{\pi}{6}\right)^5 - \left(\frac{\pi}{6}\right)^2$

(B) 0

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

(D) $\left(\frac{\pi}{6}\right)^2 - \left(\frac{\pi}{6}\right)^5$

29) $\int_0^2 f(x)dx =$ ______; where $f(x) = \max\{x, x^2\}$.

(A) $\frac{17}{6}$

(B) $\frac{13}{6}$

(C) $\frac{8}{3}$

(D) $\frac{19}{6}$

30) Area bounded by curve $y = \tan \pi x$; $x \in \left[-\frac{1}{4}, \frac{1}{4}\right]$ and X - axis is ______.

(A) $\log 2$

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

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

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

31) If the area of the region bounded by two curves $y = x^2$ and $y = x^3$ is $\frac{k}{6}$ then $k =$ ______.

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

(B) $\frac{1}{12}$

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

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

Rough Work

32) Area bounded by the ellipse $\frac{x^2}{4}+\frac{y^2}{16}=4$ is ________.

(A) 8π (B) 32π

(C) 64π (D) $\frac{\pi}{64}$

πab

$\frac{x^2}{16}+\frac{y^2}{64}=1$

$\pi(4)(8)$

$=32\pi$

33) The order and degree of the differential equation $(y''')^3+(y'')^4+(y')^4+y=7$ are ________ respectively.

(A) 3 and 3 (B) 1 and 4

(C) 4 and 1 (D) 2 and 4

3

34) The number of arbitrary constant in the particular solution of a differential equation of order 4 will be ________.

(A) 4 (B) 2

(C) 0 (D) 1

35) Integrating factor of the differential equation $y\,dx-(x+2y^2)\,dy=0$ is ________.

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

(C) y (D) $\frac{1}{y}$

$y\,dx = (x+2y^2)\,dy$

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

$\frac{dx}{dy}-\frac{x}{y}=2y$

$e^{-\int \frac{1}{y}\,dy}$

$e^{-\ln y}$

y^{-1}

$\frac{1}{y}$

$y^{-1} = \frac{1}{y}$

$\int -\frac{1}{y} = e^{-\ln y}$

36) Measure of the angle between the vectors $\bar{a}=\hat{i}-\hat{j}+\hat{k}$ and $\bar{b}=\hat{i}+\hat{j}+\hat{k}$ is ________.

$=\frac{1-1+1}{\sqrt{3}\sqrt{3}}=\frac{1}{3}$

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

(C) $\sin^{-1}\frac{2\sqrt{2}}{3}$ (D) $\sin^{-1}\frac{1}{3}$

$\cos\theta = \frac{1}{3}$

3^2-1

$9-1$

$\theta=\cos^{-1}\frac{1}{3}$

$\frac{2\sqrt{2}}{3}$

Rough Work

37) If $\vec{a}=\hat{i}+2\hat{j}+\hat{k}$ and $\vec{b}=\hat{i}-2\hat{j}-3\hat{k}$, then $(\vec{a}+\vec{b})\cdot(\vec{a}-\vec{b})$ = ________.

(A) 8 (B) −8

(C) −2 (D) 2

38) Find the area of a parallelogram whose adjacent sides are given by the vectors $\vec{a}=3\hat{i}+5\hat{j}-2\hat{k}$ and $\vec{b}=2\hat{i}+\hat{j}+3\hat{k}$.

(A) $\sqrt{507}$ (B) $\sqrt{387}$

(C) $\frac{1}{2}\sqrt{507}$ (D) 25

39) Let $|\vec{x}|=|\vec{y}|=|\vec{x}+\vec{y}|=1$ and if measure of the angle between $\vec{x}$ and $\vec{y}$ is α, then sin α = ________

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

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

40) $\hat{i}\cdot(\hat{k}\times\hat{j})+\hat{j}\cdot(\hat{i}\times\hat{k})+\hat{k}\cdot(\hat{j}\times\hat{i})+\hat{i}\cdot(\hat{i}\times\hat{j})+\hat{j}\cdot(\hat{j}\times\hat{k})$ = ________

(A) 3 (B) 1

(C) −1 (D) −3

41) For three vectors $\vec{a},\vec{b}$ and $\vec{c}$, $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ and $|\vec{a}|=3, |\vec{b}|=4$, $|\vec{c}|=5$, then evaluate $2(\vec{a}\cdot\vec{b}+\vec{b}\cdot\vec{c}+\vec{c}\cdot\vec{a})$.

(A) −25 (B) 50

(C) 100 (D) −50

Rough Work

42) If the lines $\frac{2x-5}{k}=\frac{y+2}{-5}=\frac{z}{1}$ and $\frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ are perpendicular to each other, then value of k is ________.

(A) 7 (B) 14

(C) −7 (D) 26

$k(1)+(-5)(2)+(1)(3)$

$k-10+3=0$

$k=7$

43) If the plane $2x+3y+4z=1$ intersects X-axis, Y-axis and Z-axis at the points A, B and C respectively, then the centroid of a Δ ABC is ________.

(A) $\left(\frac{1}{6},\frac{1}{9},\frac{1}{12}\right)$ (B) (6, 9, 12)

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

$2x+3y+4z=1$

$(2,0,0)$

$(0,3,0)$

$(0,0,4)$

$\left(\frac{2}{3},\frac{3}{3},\frac{4}{3}\right)$

44) Distance between the two planes $2x-2y+z=5$ and $6x-6y+3z=25$ is ________ units.

(A) $\frac{20}{3}$ (B) $\frac{10}{9}$

(C) $\frac{20}{9}$ (D) 10

$(2x-2y+z)$

$\frac{5}{\sqrt{4+4+1}}$

$\frac{5}{3}-\frac{25}{\frac{28}{3}}$

$\frac{20}{3}$

45) The objective function of a linear programming problem is ________.

(A) a constant

(B) a quadratic equation

(C) a function to be optimized

(D) an inequality

Rough Work

46) The vertices of the feasible region determined by some linear constraints are (0,2), (1,1), (3,3), (1,5). 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 (3,3) and (1,5) is ________.

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

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

$Z = 3p + 3q$

$Z = p + 5q$

47) If the vertices of a feasible region are O(0,0), A(10,0), B(0,20), C(15,15), then minimum value of a objective function $Z = 10x - 20y + 30$ is ________.

(A) 30 (B) 130

(C) −120 (D) −370

$3p + 3q = p + 5q$

$2p = 2q$

48) If P(E) = 0.8, P(F) = 0.5 and P(F/E) = 0.4, then P(E/F) = ________.

(A) 0.64 (B) 0.32

(C) 0.80 (D) 0.98

$\frac{P(F \cap E)}{P(E)} = 0.4$

$= 0.4 \times 0.8$

$= 0.32$

30

100 − 30 = 70

$\frac{0.32}{0.5}$

49) A random variable X has the following probability distribution:

X	0	1	2	3	4
P(X)	0.1	k	$2k$	$2k$	0.15

then $P(X \leq 1) =$ ________

(A) 0.15 (B) 0.25

(C) 0.55 (D) 0.75

150 − 300 + 30

−120

$5k + 0.25 = 1$ $5k = 0.75$

50) The probability of obtaining an even prime number on each dice when a pair of dice is rolled is ________.

(A) 1 (B) 0

(C) $\frac{1}{36}$ (D) $\frac{35}{36}$

$k = 0.15$

$x \leq 1$

$0 \times 0.1 + 1 \times 0.15$

0.15

(2,2)

1, 2, 3, 4, 5

$\frac{1}{3}$

050 (E)

(MARCH, 2020)
SCIENCE STREAM
(CLASS - XII)
(New Course)

(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.
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]

$\sin^{-1} 2\tan t$

1) Find the value :

$$\tan\frac{1}{2}\left[\sin^{-1}\frac{2x}{1+x^2}+\cos^{-1}\frac{1-y^2}{1+y^2}\right],\ |x|<1, y>0 \text{ and } xy<1, x\neq y.$$

2) If $y=50\,e^{10x}+60\,e^{-10x}$, prove that $\frac{d^2y}{dx^2}=100y$.

3) Evaluate $\int_0^1 e^x dx$ as the limit of sum. $\rightarrow \lim_{h\to 0} h \sum_{i=0}^{n} (a+ih)$

4) If the area bounded by the parabola $y^2 = 4ax$ and its latus rectum in the first quadrant is 48 units then, using integration find the value of a.

5) Find the area between the curves $y = 2x$ and $y = x^2$.

OR

Find the area of the smaller region bounded by the ellipse $\frac{x^2}{9} + \frac{y^2}{4} = 1$ and the line $2x + 3y = 6$.

6) If the vectors $\bar{a}, \bar{b}, \bar{c}$ are coplanar then, prove that $\bar{a}+\bar{b}, \bar{b}+\bar{c}, \bar{c}+\bar{a}$ are coplanar.

7) Find the equation of the plane passing through the intersection of the planes $x + y + z - 6 = 0$ and $2x + 3y + 4z + 5 = 0$ and the point (2, 3, 4).

8) Bag-I contains 3 gold and 4 silver coins while another Bag-II contains 5 gold and 6 silver coins. One coin is drawn at random from one of the bags. Find the probability that a randomly selected coin is of gold.

OR

Find the mean of the number obtained on a throw of an unbiased dice.

SECTION - B

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

9) Consider $f : R^+ \to [-5, \infty)$ given by $f(x) = 9x^2 + 6x - 5$. Show that f is invertible with $f^{-1}(y) = \left(\frac{\left(\sqrt{y+6}\right)-1}{3}\right)$; where R^+ is the set of all non-negative real numbers.

10) Solve the following system of equations by matrix method.

$x+y+z=6,\ 2y+z=7,\ x-y+z=2$

OR

Express the matrix $A=\begin{bmatrix}3 & -2 & 1\\ 4 & 0 & 6\\ -1 & 2 & 1\end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrices.

11) If $x=a(\cos\theta+\theta\sin\theta)$ and $y=a(\sin\theta-\theta\cos\theta)$ then, find $\frac{d^2y}{dx^2}$.

12) A line makes angles α, β, γ and δ with the diagonals of a cube, prove that

$$\sin^2\alpha+\sin^2\beta+\sin^2\gamma+\sin^2\delta=\frac{8}{3}$$

OR

Find the equation of the line passing through (1,2,3) and parallel to the planes $x-y+2z-5=0$ and $3x+y+z-6=0$.

13) Solve the following linear programming problem graphically. Subject to the constraints : $x+y\le 50,\ 3x+y\le 90,\ x\ge 0,\ y\ge 0$, obtain the maximum and minimum values of $Z=5x+10y$.

14) If a fair coin is tossed 10 times, find the probability of

i) exactly 2 heads

ii) at least 9 heads

SECTION-C

■ Answer the following 15 to 18 questions as directed in the question. (Each question carries 4 marks) [16]

15) Using properties of determinants prove :

$$\begin{vmatrix} a & a^2 & 1+pa^3 \\ b & b^2 & 1+pb^3 \\ c & c^2 & 1+pc^3 \end{vmatrix} = (1+pabc)(a-b)(b-c)(c-a)$$

16) Find the global maximum and minimum values of the function f given by $f(x) = 2x^3 - 15x^2 + 36x + 1, x \in [1,5]$.

OR

Show that of all the rectangles inscribed in a given fixed circle, the square has the maximum area.

17) Find : $\int \sqrt[3]{\tan x}\, dx;\ \left(\text{where } x \neq \dfrac{k\pi}{2}, k \in Z\right)$

18) Obtain the particular solution of the differential equation :

$$\left\{x\cos\left(\frac{y}{x}\right) + y\sin\left(\frac{y}{x}\right)\right\} y\,dx = \left\{y\sin\left(\frac{y}{x}\right) - x\cos\left(\frac{y}{x}\right)\right\} x\,dy$$

where : $y = \dfrac{\pi}{2}$ when $x = 2$.

$\int \sqrt[3]{\tan x}$

$x = t^3$

$\tan x^{1/3}$

$\cos x^{1/3} = t$

$\frac{1}{3}\cos^{-2/3} x \times \sin x$