

Answer Book – જવાબવહી

18/03/2024-15:00



SCI 2024 (B)



મુખ્ય જવાબવહી	પુરવણી	કુલ
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H.S.C. વિજ્ઞાન પ્રવાહ 24-M-24

વિષય અને કોડ નંબર	ગણિત	050
પરીક્ષાની તારીખ		
જવાબની ભાષા		

પરીક્ષાર્થીએ જવાબ લખવાનું શરૂ કરતાં પહેલાં પાન નં. 2 પરની સૂચનાઓ અવશ્ય વાંચવી.



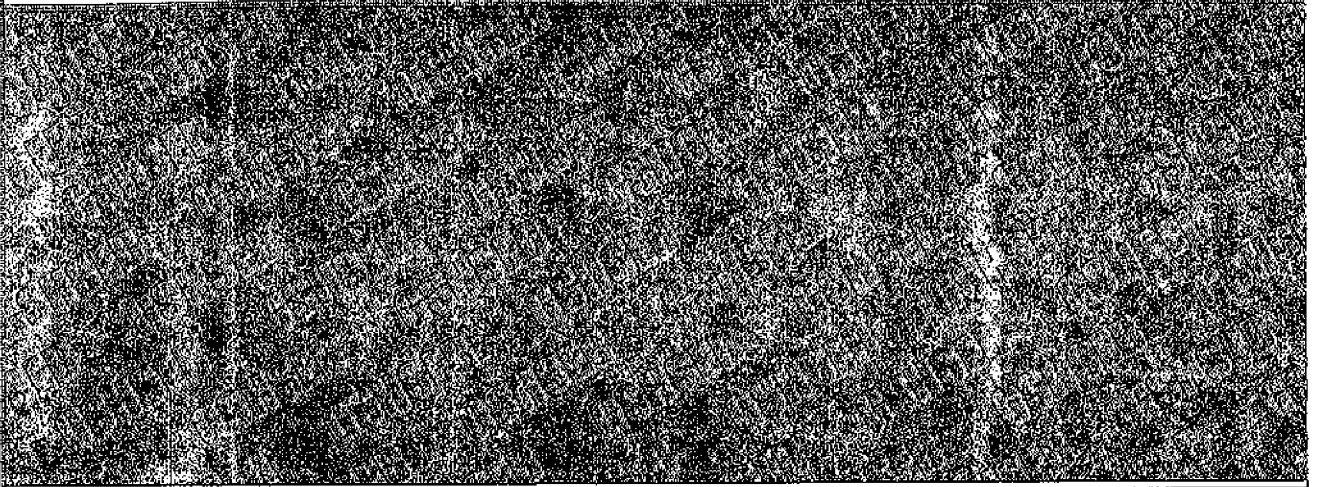
વિભાગ	પરીક્ષકે આપેલ ગુણ	પરીક્ષકની		સમીક્ષકે આપેલ ગુણ	કો-ઓર્ડિનેટરે આપેલ ગુણ	બોર્ડની કચેરીના ઉપયોગ માટે	
		સહી	નિમણૂક નંબર				
A							
B							
C							
કુલ ગુણ અપૂર્ણકમાં							
કુલ ગુણ પૂર્ણકમાં							
કુલ ગુણ શાંદીમાં							

GSHS

પરીક્ષકની સહી	સમીક્ષકની સહી	કો-ઓર્ડિનેટરની સહી
પરીક્ષકની નિમણૂક નંબર	સમીક્ષકની નિમણૂક નંબર	કો-ઓર્ડિનેટરની નિમણૂક નંબર



ગુણાંકન



વિભાગ-A			વિભાગ-B			વિભાગ-C		
પ્રશ્ન ક્રમાંક	ગુણ		પ્રશ્ન ક્રમાંક	ગુણ		પ્રશ્ન ક્રમાંક	ગુણ	
1			13			22		
2			14			23		
3			15			24		
4			16			25		
5			17			26		
6			18			27		
7			19			મેળવેલ કુલ ગુણ		16
8			20			પરીક્ષકની સહી		
9			21					
10			મેળવેલ કુલ ગુણ		18			
11			પરીક્ષકની સહી			વેરીફાયરની સહી		
12								
મેળવેલ કુલ ગુણ		16	વિભાગ : A + B + C =				50	
પરીક્ષકની સહી			પેજ નં. 3 ઉપરના પ્રશ્નના ક્રમવાર મેળવેલ ગુણ મૂકીને મહત્તમ ગુણ ગણતરીમાં લઈ વિભાગવાર દર્શાવવાના રહેશે અને ઉત્તરવહીના મુખ્ય પેજ ઉપર વિભાગવાર ગુણ લખવાના રહેશે.					

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PART-B

Section-A

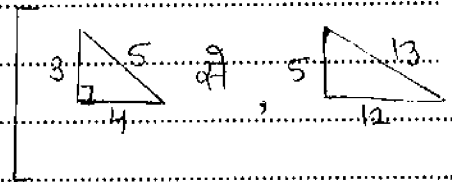
Ans-1

$$\cos^{-1} \frac{4}{5} + \cos^{-1} \frac{12}{13} = \cos^{-1} \frac{33}{65}$$

प्रमाणित,

$$\text{L.H.S.} = \cos^{-1} \frac{4}{5} + \cos^{-1} \frac{12}{13}$$

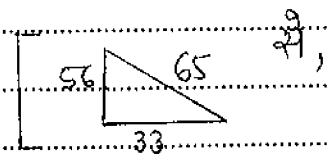
$$= \tan^{-1} \frac{3}{4} + \tan^{-1} \frac{5}{12}$$



$$= \tan^{-1} \left(\frac{36 + 20}{48 - 15} \right)$$

$$\because \frac{3}{4} \cdot \frac{5}{12} = \frac{15}{48} < 1$$

$$= \tan^{-1} \frac{56}{33}$$



$$= \cos^{-1} \frac{33}{65}$$

— Ans

$$= \text{R.H.S.}$$



Ans = 2

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

प्रमाणानुसार,

जहाँ

माना कि,

$$-\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$$

$$x = \sin \theta$$

$$\theta = \sin^{-1}x$$

$$\text{L.H.S.} = \sin^{-1}(2\sin\theta\sqrt{1-\sin^2\theta})$$

$$= \sin^{-1}(2\sin\theta\cos\theta)$$

$$= \sin^{-1}(\sin 2\theta) \quad \left(\because 2\theta \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right] \right)$$

$$= 2\theta$$

$$= 2\sin^{-1}x \quad \text{--- Ans}$$

$$= \text{R.H.S.}$$

अतः प्रमाणानुसार,

$$-\frac{1}{\sqrt{2}} \leq x \leq \frac{1}{\sqrt{2}}$$

$$\therefore -\frac{\pi}{4} \leq \sin^{-1}x \leq \frac{\pi}{4} \quad \left(\because \sin^{-1} \text{ को गुणा करने पर } \right)$$

$$\therefore -\frac{\pi}{2} \leq 2\sin^{-1}x \leq \frac{\pi}{2} \quad \left(\because 2 \text{ को गुणा करने पर } \right)$$

$$\therefore 2\theta \in \left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$$



Ans. - 3

$$x^y + y^x = 1$$

$$\therefore x^y = 1 - y^x$$

$$\therefore e^{y \log x} = 1 - e^{x \log y}$$

$$\therefore e^{y \log x} \left[y \left(\frac{1}{x} \right) + \log x \frac{dy}{dx} \right] = 0 - e^{x \log y} \left[\frac{x dy + \log y}{y dx} \right]$$

$$\therefore x^y \left[\frac{y}{x} + \log x \frac{dy}{dx} \right] = -y^x \left[\frac{x dy + \log y}{y dx} \right]$$

$$\therefore x^{y-1} y + x^y \log x \frac{dy}{dx} = -y^{x-1} x \frac{dy}{dx} + (-y^x \log y)$$

$$\therefore x^y \log x \frac{dy}{dx} + y^{x-1} x \frac{dy}{dx} = \frac{-y^x \log y - x^{y-1} y}{1}$$

$$\therefore \frac{dy}{dx} = \frac{-y^x \log y - x^{y-1} y}{x^y \log x + y^{x-1} x} \quad \text{--- Ans}$$

इस प्रकार,

$x^y + y^x = 1$ का प्रथम अवकलन का मान

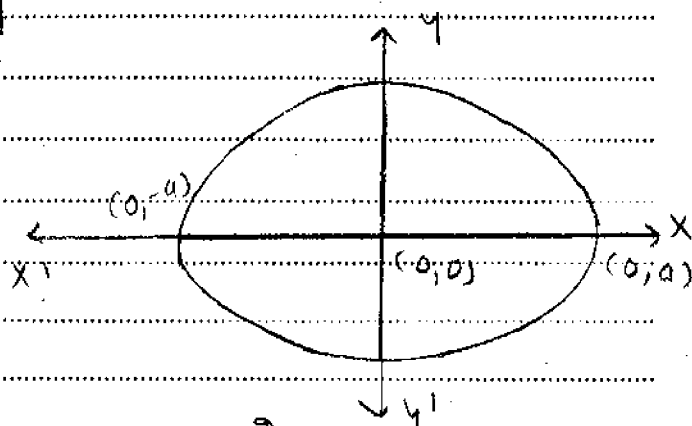
$$\frac{-y^x \log y - x^{y-1} y}{x^y \log x + y^{x-1} x} \quad \frac{y}{x}$$



Ans - 5

$$9x^2 + 16y^2 = 144$$

$$\therefore \frac{x^2}{16} + \frac{y^2}{9} = 1$$



चूँकि,

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \text{ से तुलना करने पर,}$$

$$a^2 = 16$$

$$b^2 = 9$$

$$\therefore a = 4$$

$$\therefore b = 3$$

→ आवृत्त प्रदेश का कुल क्षेत्रफल (A) = $4I$

$$I = \int_0^4 y \, dx$$

$$= \int_0^4 \frac{3}{4} \sqrt{16 - x^2} \, dx$$

$$= \frac{3}{4} \int_0^4 \sqrt{16 - x^2} \, dx$$

$$= \frac{3}{4} \left[\frac{x}{2} \sqrt{16 - x^2} + \frac{16}{2} \sin^{-1} \frac{x}{4} \right]_0^4$$

$$= \frac{3}{4} \left[\left(0 + 8 \left(\frac{\pi}{2} \right) \right) - 0 \right]$$

$$= \frac{3}{4} (4\pi)$$



$$\therefore I = 3\pi$$

$$\begin{aligned}\text{आवृत्त प्रदेश का क्षेत्रफल (A)} &= 4I \\ &= 4 \times 3\pi \\ &= 12\pi\end{aligned}$$

— Ans

$$\text{Ans} = 7$$

$$\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$$

$$\therefore \sec^2 y \tan x \, dy = -\sec^2 x \tan y \, dx$$

$$\therefore \frac{\sec^2 y \, dy}{\tan y} = -\frac{\sec^2 x \, dx}{\tan x}$$

$$\therefore \int \frac{\sec^2 y}{\tan y} \, dy = - \int \frac{\sec^2 x}{\tan x} \, dx$$

$$\therefore \log |\tan y| = -\log |\tan x| + \log |C|$$

$$\therefore \log |\tan y| = \log \left| \frac{C}{\tan x} \right|$$

$$\therefore \tan y = \frac{C}{\tan x}$$

$$\therefore \tan x \cdot \tan y = C \quad \left| \begin{array}{l} \text{— Ans} \\ \leftarrow \text{आपक हल} \end{array} \right.$$



Ans - 9

विंदु $\vec{a} = (1, 2, -4)$

$$\vec{b}_1 = (3, -16, 7)$$

$$\vec{b}_2 = (3, 8, -5)$$

→ $\vec{b}_1$ व $\vec{b}_2$ पर लंब रेखा की दिशा = $\vec{b}_3$

$$\vec{b}_3 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 3 & -16 & 7 \\ 3 & 8 & -5 \end{vmatrix}$$

$$\begin{aligned} &= \hat{i}(80 - 56) - \hat{j}(-15 - 21) + \hat{k}(24 + 48) \\ &= 24\hat{i} - (-36)\hat{j} + 72\hat{k} \\ &= 24\hat{i} + 36\hat{j} + 72\hat{k} \end{aligned}$$

विंदु $\vec{a} (1, 2, -4)$ व $\vec{b}_3 (24, 36, 72)$ का
काल्पनिक स्वरूप,

$$\frac{x-1}{24} = \frac{y-2}{36} = \frac{z+4}{72}$$

Ans - 10.

बिंदु $(5, 2, -4)$ व सदिश $3\hat{i} - 2\hat{j} + 8\hat{k}$ के समान्तर रेखा का सदिश व कार्तीय समीकरण :-

$$\vec{a} = (5, 2, -4)$$

$$\vec{b} = (3, -2, 8)$$

सदिश समीकरण,

$$\vec{r} = \vec{a} + t \vec{b}$$

$$\therefore \vec{r} = 5\hat{i} + 2\hat{j} - 4\hat{k} + t(3\hat{i} - 2\hat{j} + 8\hat{k})$$

कार्तीय संकल्प समीकरण

$$\therefore \frac{x-5}{3} = \frac{y-2}{-2} = \frac{z+4}{8}$$

$$\therefore \frac{x-5}{3} = \frac{2-y}{2} = \frac{z+4}{8}$$



Ans. - 11

$$P(A) = 0.6$$

$$P(B) = 0.3$$

$$P(A \cap B) = 0.2$$

$$(i) \quad P(A/B) = \frac{P(A \cap B)}{P(B)}$$

$$\therefore P(A/B) = \frac{0.2}{0.3}$$

$$\therefore P(A/B) = 0.67 \quad \text{--- Ans}$$

$$(ii) \quad P(B/A) = \frac{P(A \cap B)}{P(A)}$$

$$\therefore P(B/A) = \frac{0.2}{0.6}$$

$$\therefore P(B/A) = 0.33 \quad \text{--- Ans}$$

Ans - 4

$$\int \frac{1}{\sqrt{8+3x-x^2}} dx$$

$$= \int \frac{1}{\sqrt{\frac{9+8-x^2+3x-9}{4}}} dx$$

$$= \int \frac{1}{\sqrt{\frac{23}{4} - \left(x - \frac{3}{2}\right)^2}} dx$$

$$= \int \frac{1}{\sqrt{\left(\frac{\sqrt{23}}{2}\right)^2 - \left(x - \frac{3}{2}\right)^2}} dx$$

$$= \sin^{-1} \left(\frac{x - \frac{3}{2}}{\frac{\sqrt{23}}{2}} \right) + C$$

$$\sin^{-1} \left(\frac{2x-3}{\sqrt{23}} \right) + C$$



Sec-c

Ans-1

$$\begin{bmatrix} x & -5 & -1 \end{bmatrix}_{(1 \times 3)} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}_{(3 \times 3)} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}_{(3 \times 1)} = 0$$

$$\therefore \begin{bmatrix} x-2 & -10 & 2x-5-3 \end{bmatrix}_{(1 \times 3)} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}_{(3 \times 1)} = 0$$

$$\therefore \begin{bmatrix} x-2 & -10 & 2x-8 \end{bmatrix}_{(1 \times 3)} \begin{bmatrix} x \\ y \\ 1 \end{bmatrix}_{(3 \times 1)} = 0$$

$$\therefore \begin{bmatrix} (x-2)x - 40 + 2x - 8 \end{bmatrix}_{(1 \times 1)} = 0$$

$$\therefore x^2 - 2x - 40 + 2x - 8 = 0$$

$$\therefore x^2 - 48 = 0$$

$$\therefore x^2 = 48$$

$$\therefore x = \pm 4\sqrt{3}$$

— Am

इस प्रकार,

आवृत्ति में रहे घटक का मूल्य $x = \pm 4\sqrt{3}$ है।



Ans - 23

$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 6$$

$$0 + \frac{1}{y} + \frac{3}{z} = 11$$

$$\frac{1}{x} - \frac{2}{y} + \frac{1}{z} = 0$$

अतः,

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 3 \\ 1 & -2 & 1 \end{bmatrix}$$

$$X = \begin{bmatrix} \frac{1}{x} \\ \frac{1}{y} \\ \frac{1}{z} \end{bmatrix}$$

$$B = \begin{bmatrix} 6 \\ 11 \\ 0 \end{bmatrix}$$

$$|A| = \begin{vmatrix} 1 & 1 & 1 \\ 0 & 1 & 3 \\ 1 & -2 & 1 \end{vmatrix}$$

$$= 1(1+6) - 1(0-3) + 1(-1)$$

$$= 7 - 1(-3) - 1$$

$$= 7 + 3 - 1$$

$$= 9 \neq 0$$

∴ A^{-1} का अस्तित्व है।



$$A_{11} = 7$$

$$A_{12} = +3$$

$$A_{13} = -1$$

$$A_{21} = -3$$

$$A_{22} = 0$$

$$A_{23} = +3$$

$$A_{31} = 2$$

$$A_{32} = -3$$

$$A_{33} = 1$$

$$\text{adj } A = \begin{bmatrix} 7 & -3 & 2 \\ 3 & 0 & -3 \\ -1 & 3 & 1 \end{bmatrix}$$

→ जैसा कि हम जानते हैं कि

$$A X = B$$

$$\therefore X = A^{-1} B$$

$$\therefore X = \frac{1}{|A|} \text{adj } A \cdot B$$

$$\therefore X = \frac{-1}{9} \begin{bmatrix} 7 & -3 & 2 \\ 3 & 0 & -3 \\ -1 & 3 & 1 \end{bmatrix} \begin{bmatrix} 6 \\ 11 \\ 0 \end{bmatrix}$$

$$\therefore \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{9} \begin{bmatrix} 9 \\ 18 \\ 27 \end{bmatrix}$$

$$\therefore \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$$



$$\therefore \frac{1}{x} = 1$$

$$\therefore x = 1$$

$$\therefore \frac{1}{y} = 2$$

$$\therefore y = \frac{1}{2}$$

$$\therefore \frac{1}{z} = 3$$

$$\therefore z = \frac{1}{3}$$

$$\rightarrow x = 1$$

$$\rightarrow y = \frac{1}{2}$$

$$\rightarrow z = \frac{1}{3}$$

Ans - 24

$$x = a (\cos t + t \sin t) \quad y = a (\sin t - t \cos t)$$

$$\therefore \frac{dx}{dt} = a (-\sin t + (t \cos t + \sin t))$$

$$\therefore \frac{dx}{dt} = a (-\sin t + t \cos t + \sin t)$$

$$\therefore \frac{dx}{dt} = a (t \cos t)$$

$$\therefore \frac{dx}{dt} = a t \cos t$$



$$y = a (\sin t - t \cos t)$$

$$\therefore \frac{dy}{dt} = a (\cos t - (-t \sin t + \cos t))$$

$$\therefore \frac{dy}{dt} = a (\cos t + t \sin t - \cos t)$$

$$\therefore \frac{dy}{dt} = a t \sin t$$

प्रश्नानुसार ,

$$\therefore \frac{dy}{dx} = \frac{dy/dt}{dx/dt} = \frac{a t \sin t}{a t \cos t}$$

$$\therefore \frac{dy}{dx} = \tan t$$

$$\therefore \frac{d^2y}{dx^2} = \sec^2 t \frac{dt}{dx}$$

$$\therefore \frac{d^2y}{dx^2} = \frac{\sec^2 t}{a t \cos t}$$

$$\therefore \frac{d^2y}{dx^2} = \frac{\sec^3 t}{a t}$$

$$\therefore \frac{d^2y}{dx^2} = \frac{1}{a t \cos^3 t}$$



$t = \frac{\pi}{4}$ पर

$$\frac{d^2y}{dx^2} = \frac{1}{a \left(\frac{\pi}{4} \right) \cos^3 \left(\frac{\pi}{4} \right)}$$

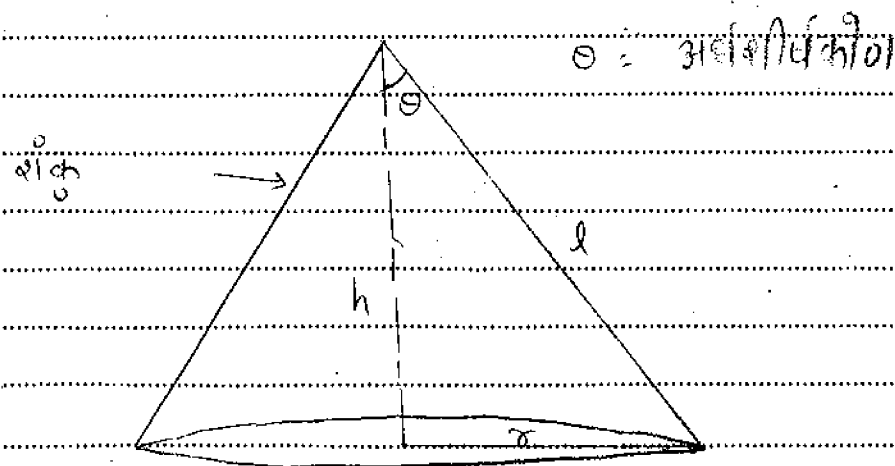
$$\therefore \frac{d^2y}{dx^2} = \frac{1}{a \left(\frac{\pi}{4} \right) \left(\frac{1}{\sqrt{2}} \right)^3}$$

$$\therefore \frac{d^2y}{dx^2} = \frac{4}{\pi a (1) (2)^{3/2}}$$

$$\therefore \frac{d^2y}{dx^2} = \frac{4 \cdot 2^{3/2}}{\pi a}$$

$\therefore \frac{d^2y}{dx^2} = \frac{2^{7/2}}{\pi a}$	$= \frac{8\sqrt{2}}{\pi a}$
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Ans-25





चित्र में दर्शाए अनुसार,

- शंक की त्रिज्या = r
- शंक की ऊँचाई = h
- शंक की तिर्यक ऊँचाई = l
- शंक का अर्धशीर्षकोण = θ

$$l^2 = r^2 + h^2$$

$$r^2 = l^2 - h^2$$

प्रश्नानुसार,

$$\begin{aligned}\text{शंक का आयतन} &= \frac{\pi}{3} r^2 h \\ &= \frac{\pi}{3} (l^2 - h^2) h\end{aligned}$$

$$f(h) = \frac{\pi}{3} (l^2 h - h^3)$$

$$f'(h) = \frac{\pi}{3} (l^2 - 3h^2)$$

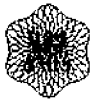
$f'(h) = 0$ लेने पर,

$$l^2 = 3h^2$$

$$\therefore 3h^2 = l^2$$

$$\therefore h^2 = \frac{l^2}{3}$$

$$\therefore h = \frac{l}{\sqrt{3}}$$



$$f''(h) = \frac{\pi}{3} (0 - 6h)$$

$$f''(h) = \frac{-6\pi h}{3}$$

$$f''(h) = -2\pi h$$

$$f''\left(\frac{l}{\sqrt{3}}\right) = \frac{-2\pi l}{\sqrt{3}} < 0$$

$\therefore h = \frac{l}{\sqrt{3}}$ पर शंकु का आयतन महत्तम होगा।

$$x^2 = l^2 - h^2$$

$$\therefore x^2 = l^2 - \frac{l^2}{3}$$

$$\therefore x^2 = \frac{3l^2 - l^2}{3}$$

$$\therefore x^2 = \frac{2l^2}{3}$$

$$\therefore x = \frac{\sqrt{2}l}{\sqrt{3}}$$



प्राप्त
उत्तर

आकृति पर से,

$$\tan \theta = \frac{x}{h}$$

$$\therefore \tan \theta = \frac{\sqrt{2} \times 1 \times \sqrt{3}}{\sqrt{3} \times 1}$$

$$\therefore \tan \theta = \sqrt{2}$$

$$\therefore \theta = \tan^{-1} \sqrt{2} \quad \text{--- Ans}$$



Ans - 13

$$R = \{ (a, b) : a \leq b^3 \}$$

→ (i) स्वतुल्यता के लिए,

$$\left(\frac{1}{2}, \frac{1}{2} \right) \text{ के लिए } \frac{1}{2} \not\leq \left(\frac{1}{2} \right)^3$$

$\therefore R$ यह स्वतुल्य नहीं है।

→ (ii) सममितता के लिए,

$$\begin{array}{ll} (1, 2) \text{ के लिए } 1 \leq (2)^3 \\ (2, 1) \text{ के लिए } 2 \not\leq (1)^3 \end{array}$$

$\therefore (1, 2), (2, 1) \notin R$ होने से R यह सममित नहीं है।

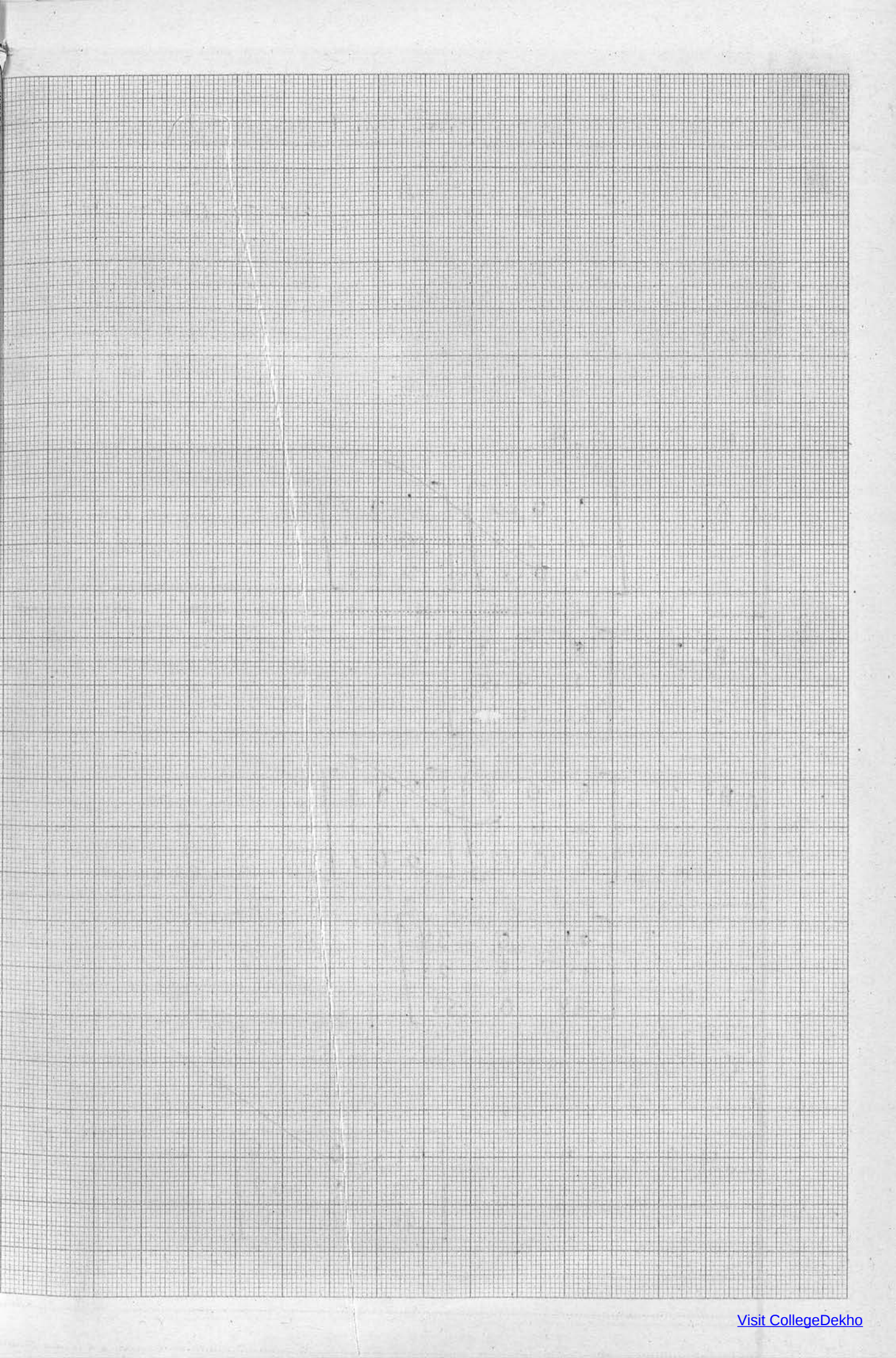
→ (iii) संक्रामकता के लिए,

$$\left(3, \frac{3}{2} \right) \text{ में } 3 \leq \left(\frac{3}{2} \right)^3$$

$$\left(\frac{3}{2}, \frac{6}{5} \right) \text{ में } \frac{3}{2} \leq \left(\frac{6}{5} \right)^3$$

परंतु $\left(3, \frac{6}{5} \right)$ में $3 \not\leq \left(\frac{6}{5} \right)^3$ के लिए यह उचित नहीं है।

$\therefore R$ यह संक्रामक नहीं है। [Visit CollegeDekho](http://VisitCollegeDekho)



Ans-14

$$A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$$

प्र. 2

$$A^3 = 6A^2 - 7A - 2I$$

जहाँ

$$A^2 = A \cdot A$$

$$\therefore A^2 = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$$

$$\therefore A^2 = \begin{bmatrix} 5 & 0 & 8 \\ 2 & 4 & 5 \\ 8 & 0 & 13 \end{bmatrix}$$

$$\therefore A^3 = \begin{bmatrix} 5 & 0 & 8 \\ 2 & 4 & 5 \\ 8 & 0 & 13 \end{bmatrix} \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} 21 & 0 & 34 \\ 12 & 8 & 23 \\ 34 & 0 & 55 \end{bmatrix}$$

प्रश्नानुसार,

$$L.H.S = A^3 = \begin{bmatrix} 21 & 0 & 34 \\ 12 & 8 & 23 \\ 34 & 0 & 55 \end{bmatrix} \quad \text{--- प. (1)}$$

18 - 03 - 24

विभाग.....

$$\begin{array}{cccccccccc} \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} \\ \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & + & \boxed{} & = & \boxed{} \end{array}$$



Sec-B

Ans - 14

$$N_H S = 6A^2 - 7A - 2I$$

$$= \begin{bmatrix} 30 & 0 & 48 \\ 12 & 24 & 30 \\ 48 & 0 & 78 \end{bmatrix} - \begin{bmatrix} 7 & 0 & 14 \\ 0 & 14 & 7 \\ 14 & 0 & 21 \end{bmatrix} - \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

21	0	34
12	8	23
34	0	55

पर. (१५)

$$= \text{L.H.S}$$

परि० (i) व (ii) वी

$$L_n H_n S = R_n H_n S$$



विभाग.....

$$\begin{array}{cccccccccc} \square & + & \square & + & \square & + & \square & + & \square & + & \square & + & \square & + & \square & + & \square \\ \square & + & \square & + & \square & + & \square & + & \square & + & \square & + & \square & + & \square & + & \square \end{array} = \square$$



Ans. - 15

$$\Delta = \begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix}$$

$$A_{31} = (-1)^{3+1} \begin{vmatrix} x & yz \\ y & zx \end{vmatrix} = zx^2 - y^2z$$

$$A_{32} = (-1)^{3+2} \begin{vmatrix} 1 & yz \\ 1 & zx \end{vmatrix} = -(zx - yz)$$

$$A_{33} = (-1)^{3+3} \begin{vmatrix} 1 & x \\ 1 & y \end{vmatrix} = y - x$$

यद्वनानुकीर्त,

$$\begin{aligned} &= A_{31} A_{31} + A_{32} A_{32} + A_{33} A_{33} \\ &= zx^2 - y^2z + (yz - xz)(z) + (xy)(y - x) \\ &= zx^2 - y^2z + yz^2 - xz^2 + xy^2 - x^2y \\ &= zx^2 - x^2y - y^2z + xy^2 + yz^2 - xz^2 \\ &= x^2(z - y) - x(z^2 - y^2) + yz^2 - y^2z \\ &= x^2(z - y) - x(z^2 - y^2) + yz(z - y) \\ &= (z - y) [x^2 - x(z + y) + yz] \\ &= (z - y) [x^2 - xz - xy + yz] \\ &= (z - y) [x(x - z) - y(x - z)] \\ &= (z - y) (x - y) (x - z) \end{aligned}$$

$$y = (\tan^{-1} x)^2$$

$$\frac{dy}{dx} = \frac{2 \tan^2 x}{1+x^2}$$

$$\therefore (1+x^2) \frac{dy}{dx} = 2 \tan^{-1} x \quad \left(\because \text{प्रथम अवकलन से} \right)$$

$$\therefore (1+x^2) \frac{d^2y}{dx^2} + \frac{dy}{dx} (2x) = \frac{2}{1+x^2} \quad \left(\because \text{द्वितीय अवकलज} \right)$$

$$\therefore (1+x^2)^2 \frac{d^2y}{dx^2} + (2x)(1+x^2) \frac{dy}{dx} = 2$$

$$\therefore (1+x^2)^2 \frac{d^2y}{dx^2} + (2x)(1+x^2) \frac{dy}{dx} - 2 = 0$$

प्रश्नानुसार

$$y = (1+x^2)^2 \quad \text{ii} \quad (1+x^2)^2 \frac{d^2y}{dx^2} + (2x)(1+x^2) \frac{dy}{dx} - 2 = 0$$

ਸਿਦਕ ਬੀਜਾ ਹੈ।



Ans - 17

$$f(x) = 2x^3 - 24x + 107$$

$$f'(x) = 6x^2 - 24$$

$$= 6(x^2 - 4)$$

$$x^2 - 4 = 0$$

$$x^2 = 4$$

$$x = \pm 2$$

पञ्चगव्यम्

Wd $x \in [1, 3]$

$$\bullet \quad f(1) = 2 - 24 + 107 = 85$$

$$\bullet f(2) = 16 - 48 + 107 = 75$$

$$\bullet f(3) = 54 - 72 + 107 = 89 \leftarrow \text{गहलम मास}$$

प्रश्नानुसार

अतः $x \in [-1, -3]$

$$f(-1) = -2 + 24 + 107 = 129$$

$$f(-2) = -16 + 48 + 107 = 139 \leftarrow \text{गहनाम मान}$$

$$f(1.3) = -54 + 72 + 107 = 125$$

सिद्धिदा

$x \in [1, 3]$ में महत्तम मान = 89

$x \in [-1, -3]$ में महत्तम मान = 139

050 MATHS

18-03-24

विभाग.....

[illegible]

SEC - B

Ans - 19

$$1. \frac{x+1}{7} = \frac{y+1}{-6} = \frac{z+1}{1} \quad \left(\begin{smallmatrix} \text{all } l_1 \end{smallmatrix} \right)$$

$$\vec{a}_1 = (-1, -1, -1)$$

$$\therefore \vec{b}_1 = (7, -6, 1)$$

$$2. \quad \frac{x-3}{1} = \frac{y-5}{-2} = \frac{z-7}{1} \quad \left(\begin{array}{c} \text{---} \\ \text{---} \\ \text{---} \end{array} \right) \quad \text{---} \quad l_2$$

$$q_2 = (3, 5, 7)$$

$$b_2 = (1, -2, 1)$$



$$\vec{b}_1 \times \vec{b}_2 = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 7 & -6 & 1 \\ 1 & -2 & 1 \end{vmatrix}$$

$$= \hat{i}(-6+2) - \hat{j}(7-1) + \hat{k}(-14+6)$$

$$= \hat{i}(-4) - \hat{j}(6) + \hat{k}(-8)$$

$$= -4\hat{i} - 6\hat{j} - 8\hat{k}$$

$$\rightarrow |\vec{b}_1 \times \vec{b}_2| = \sqrt{(-4)^2 + (-6)^2 + (-8)^2}$$
$$= \sqrt{16 + 36 + 64}$$
$$= \sqrt{116}$$

$$\rightarrow (\vec{a_2 - a_1}) = (3, 5, 7) - (-1, -1, -1)$$

$$= (4, 6, 8)$$

$$\rightarrow (\vec{a_2} - \vec{a_1}) \cdot (\vec{b_1} \times \vec{b_2}) = (4, 6, 8) \cdot (-4, -6, -8)$$
$$= (-16 - 36 - 64)$$
$$= -116$$

→ रेखा l_1 व रेखा l_2 के बीच की दूरी

$$l = \frac{(\vec{a}_2 - \vec{a}_1) \cdot (\vec{b}_1 \times \vec{b}_2)}{|\vec{b}_1 \times \vec{b}_2|}$$

$$= \frac{-116}{\sqrt{116}}$$

[illegible]

$$d = \frac{116}{\sqrt{116}}$$

$\therefore d = 116$ इकाई

इस प्रकार ,

Q.1. रेखा l_1 व l_2 के बीच की दूरी 5116 इकाई है।