2017

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल

24 पृष्ठीय

परीक्षार्थी द्वारा भरा जावे ↓

[redacted]

स्टीकर तीर के निशान ↓ से मिलाकर लगायें

[redacted]

...र पुस्तिका का सरल क्रमांक: A - 0897455

परीक्षार्थी का रोल नम्बर

अंकों में: | 2 | 7 | 2 | 1 | 3 | 4 | 1 | 4 | 9 | - |

शब्दों में: [redacted]

नीचे दिये गये उदाहरण अनुसार रोल नम्बर भरें।

उदाहरणार्थ	1	1	2	4	3	9	5	6	8
	एक	एक	दो	चार	तीन	नौ	पांच	छः	आठ

परीक्षार्थी द्वारा भरा जावे

केन्द्राध्यक्ष / सहायक केन्द्राध्यक्ष एवं पर्यवेक्षक द्वारा भरा जावे

क :- पूरक उत्तर पुस्तिकाओं की संख्या अंकों में: 2 शब्दों में: two

ख :- परीक्षार्थी का कक्ष क्रमांक: 10

ग :- परीक्षा का दिनांक: 18 | 03 | 2017

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

हायर सेकेण्डरी सर्टी० परीक्षा केन्द्र क्रमांक-212027

पर्यवेक्षक का नाम एवं हस्ताक्षर	केन्द्राध्यक्ष / सहायक / केन्द्राध्यक्ष के हस्ताक्षर

परीक्षक एवं उपमुख्य परीक्षक द्वारा भरा जावे ↓

प्रमाणित किया जाता है कि मूल्यांकन के समय पूरक उत्तर पुस्तिकाओं की संख्या उपरोक्तानुसार सही पाई होलो क्राफ्ट स्टीकर क्षतिग्रस्त नहीं पाया गया तथा अन्दर के पृष्ठों के अनुरुप मुख्य पृष्ठ पर अंकों की प्रविष्टी एवं अकों का योग सही है।

निर्धारित मुद्रा : नाम, पदनाम, मोबाईल नम्बर, परीक्षक क्रमांक एवं पदांकित संस्था के नाम की मुद्रा लगाएं।

उप मुख्य परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा	परीक्षक के हस्ताक्षर एवं निर्धारित मुद्रा
फणीन्द्र अग्रवाल 9770039	KISHOR CHOUBE E/171771482

100/100

D. AKHTAR
9770347

केवल परीक्षक द्वारा भरा जावे।

प्रश्न क्रमांक के सम्मुख प्राप्तांकों की प्रविष्ठी करें।

प्रश्न क्रमांक	पृष्ठ क्रमांक	प्राप्तांक (अंकों में)
1		
2		
3		
4		
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11		
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15		
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26		
27		
28		

कुल प्राप्तांक शब्दों में ... कुल प्राप्तांक अंकों में

② [ ] + [ ] = [ ]

योग पूर्व पृष्ठ   पृष्ठ 2 क अंक

प्रश्न क.

Q. 1)

Q-1

(i) (b) 2

(ii) (d) $\sin^{-1} x$

(iii) (a) $26/3$

(iv) (a) $\frac{\vec{a}}{|a|}$

(v) (d) $\cot x$

Q. 2

Q-2

(i) False

(ii) True

(iii) True

(iv) False

(v) True

Rough

$|a||b| \cos\theta = 0$

$\cos 90°$

$2x+3 = A(x+3) + B(x+2)$

$A(x+3) + B(x+2)$

$A + B = 2$

$x = \sin\theta$

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

$\tan^{-1}\left(\frac{\sin\theta}{\sqrt{1-\sin^2\theta}}\right)$

$\sin^{-1} x$

$\frac{\cos x}{\sin x}$

$\frac{1}{3}(x^3)$

$\frac{1}{3}(27-1)$

$\frac{26}{3}$

$\sqrt{0.8 \times 0.2}$

$\sqrt{\frac{0.16}{100}}$

$\frac{4}{10}$ (0.4)

$\sqrt{\frac{8}{10} \times \frac{2}{10}}$

$\frac{4}{10}$

$-\frac{3}{2}, -\frac{5}{2}$

$f'(x) = 5$

$\frac{\cos x}{\sin x}$

$\sqrt{\frac{0.8}{10} \times \frac{0.2}{10}}$

$\frac{2}{5}$ $\frac{4}{10}$

③ + पृष्ठ 3 के अंक — कुल अंक

भाग पूर्व पृष्ठ

Q - 3

(i) $\sqrt{194}$ units

(ii) $Ax + By + Cz = 0$

(iii) $5/2$ unit

(iv) $\left(\frac{-3}{2}, \frac{-5}{2}, -1\right)$

(v) $\cos 3x$

5, 12, 13

(0, 12, 0)

$\sqrt{25+169}$

169
25

$\sqrt{194}$

$2x + y - z = 5$

$\frac{2x}{5} + \frac{y}{5} + \frac{z}{-5} =$

$\frac{x}{5/2}$

$-\frac{3}{2}, -\frac{5}{2}, -1$

$\frac{d \sin 3x}{dx}$

$\frac{\cos 3x \cdot \cancel{3}}{\cancel{3}}$

B
S
E

Q - 4

(i) Formula for finding square root of the Number N

$$\boxed{x_{n+1} = \frac{1}{2}\left[x_n + \frac{N}{x_n}\right]}$$

(ii) Trapezoidal rule

$$\int_a^b f(x)\,dx = \frac{h}{2}\left[y_0 + y_n + 2(y_1 + y_2 + y_3 + \cdots y_{n-1})\right]$$

here $h = \frac{b-a}{n}$

④ [ ] + [ ] = [ ]

भाग पूर्व/पृष्ठ　　पृष्ठ 4 के अंक　　कुल अंक

प्रश्न क्र.

(iii) $\boxed{\sqrt[3]{10} = 2.167}$

$2 \le \sqrt[3]{10} \le 3$

$x_1 = \frac{1}{3}\left[\cancel{2 \times 2} + \frac{10}{4}\right]$

$\frac{1}{3}\left(\frac{16+10}{4}\right) \quad \frac{26}{4 \times 3} \quad \frac{13}{6}$

$x_1 = \frac{1}{3}\left[2x_0 + \frac{N}{(x_0)^2}\right]$

2.167

$x_1 = \frac{1}{3}\left(4 + \frac{10}{4}\right) \quad \frac{13}{6}$

$x^3 + x - 3 = 0$

(iv) $\boxed{\text{Interval} = (1, 2)}$

$f(x) = x^3 + x - 3$

$f(0) = -3$

$f(1) = 1 + 1 - 3 = -1$

$f(2) = 8 + 2 - 3$

7

(v) The coefficient of y with odd subscripts in Simpson's rule $= \boxed{4}$

5

योग पृष्ठ   अंक   कुल अंक

5.

	A		B
a)	$\int \operatorname{cosec} x \, dx$	(iv)	$\log \tan \frac{x}{2} + c$
b)	$\int \frac{dx}{x\sqrt{x^2-1}}$	(i)	$\sec^{-1}x + c$
c)	$\int \sqrt{a^2-x^2}\, dx$	(ii)	$\frac{1}{2}\left[x\sqrt{a^2-x^2} + a^2 \sin^{-1}\frac{x}{a}\right]+c$
(d)	$\int \frac{dx}{\sqrt{a^2-x^2}}$	(v)	$\sin^{-1}\frac{x}{a} + c$
(e)	$\int \frac{dx}{a^2+x^2}$	(vi)	$\frac{1}{a}\tan^{-1}\frac{x}{a} + c$

B
S
E

Section - B

Question - No - 6

Or

Solve → 6 Given position vector of points A and B are -

$\overrightarrow{OA} = 7\hat{i} + 3\hat{j} + \hat{k}$

$\overrightarrow{OB} = 2\hat{i} + 5\hat{j} + 4\hat{k}$

$\overrightarrow{AB}$ = P.V of B - P.V of A

$= \overrightarrow{OB} - \overrightarrow{OA}$

$= 2\hat{i} + 5\hat{j} + 4\hat{k} - 7\hat{i} - 3\hat{j} - \hat{k}$

$= -5\hat{i} + 2\hat{j} + 3\hat{k}$

$|\overrightarrow{AB}| = \sqrt{(5)^2 + (2)^2 + (3)^2} = \sqrt{25+4+9}$

$\boxed{\sqrt{38}}$ $\underline{\sqrt{38}}$ Ans

25
13
38

प्रश्न क्र.

Question - No - 7

Solve (7) Given force $\vec{F} = 2\hat{i} - \hat{j} - \hat{k}$

its displacement $\vec{d} = 3\hat{i} + 2\hat{j} - 5\hat{k}$

To find work done

We know work $= \boxed{W = \vec{F} \cdot \vec{d}}$

$$\text{Work} = (2\hat{i} - \hat{j} - \hat{k}) \cdot (3\hat{i} + 2\hat{j} - 5\hat{k})$$

$$\text{Work} = 6 - 2 + 5$$

$$= 9 \text{ units}$$

Question - No - 8

Or

Solve :- (8:-)

The shortest distance between two straight lines whose vector equations are

$$\vec{r} = \vec{a_1} + \lambda \vec{b_1} \quad -(1)$$

$$\vec{r} = \vec{a_2} + \mu \vec{b_2}$$

B
S
E

where λ and μ are scalars is

$$S \cdot D = \frac{(\vec{a_2} - \vec{a_1}) \cdot (\vec{b_1} \times \vec{b_2})}{|\vec{b_1} \times \vec{b_2}|}$$

$$SD = \frac{[\vec{a_2} - \vec{a_1} \quad \vec{b_1} \quad \vec{b_2}]}{|\vec{b_1} \times \vec{b_2}|}$$

B S E

Question No - 9

Solve (9) value of $\int \frac{\cos(\log x)}{x} dx$ — (1)

Let $\log x = t$

Differentiating with respect to x

$$\frac{1}{x} dx = dt$$

Putting the values in (1)

$$\int \frac{\cos(\log x)}{x} dx = \int \cos t \, dt \quad \left[\because \int \cos x \, dx = \sin x\right]$$

$$= \sin t$$

$$= \sin(\log x)$$

8

Question NO - 10

Solve : (10) Value of $\int x e^x \, dx$

$\int \underset{I}{x} \, \underset{II}{e^x} \, dx =$

We know that

$$\int u \cdot v \, dx = u \int v \, dx - \int \left[\frac{du}{dx} \int v \, dx\right] dx$$

Here $u = x$,
$v = e^x$

$$\int \underset{I}{x} \, \underset{II}{e^x} \, dx = x \int e^x \, dx - \int \frac{dx}{dx} \int e^x \, dx$$

$$= x e^x - \int 1 \cdot e^x \, dx$$

$$= x e^x - e^x \qquad \left[\because \int e^x \, dx = e^x\right]$$

Question - 11

Solve: (11) Given parallel planes are

$$2x - 2y + z + 3 = 0$$

Multiplying by 2 both side, we get

$$4x - 4y + 2z + 6 = 0 \quad -(1)$$

and $4x - 4y + 2z + 5 = 0$ — (2)

We know if planes are parallel, distance between them :

$$\text{Distance} = \left| \frac{d_2 - d_1}{\sqrt{A^2 + B^2 + C^2}} \right|$$

Here $d_1 = 5$, $d_2 = 6$

$A = 4$, $B = 4$, $C = 2$

$$\therefore \text{Distance} = \left| \frac{6 - 5}{\sqrt{(4)^2 + (4)^2 + (2)^2}} \right|$$

$$= \frac{1}{\sqrt{16 + 16 + 4}}$$

$$= \frac{1}{\sqrt{36}}$$

$$\text{Distance} = \boxed{\frac{1}{6} \text{ units}}$$

Rough

$2x - 2y + z + 3 =$

$2x - 2y + z + \frac{5}{2}$

$\frac{3 - 5/2}{\sqrt{4+4+1}}$

$\frac{1/2}{3}$

$\frac{1}{6}$

प्रश्न क्र.

Question - 12.

Solve (12) To prove :-
The symmetrical form of equations

$x = ay + b$ - (B)
$z = cy + d$ is $\frac{x-b}{a} = \frac{y}{1} = \frac{z-d}{c}$

B Given equations are

S $x = ay + b$ - (1)
and $z = cy + d$ - (2)

E from (1)

$x = ay + b$

$x - b = ay$

$\frac{x-b}{a} = \frac{y}{1}$ - (3)

from (2)

$z = cy + d$

$z - d = cy$

$\frac{z-d}{c} = \frac{y}{1}$ - (4)

from (3) and (4)

$$\boxed{\frac{x-b}{a} = \frac{y}{1} = \frac{z-d}{c}}$$

which is the symmetrical form of equation.
Hence prooved !

Question No - (13)

Ans (13) To prove
$\vec{a} \times (\vec{b} + \vec{c}) + \vec{b} \times (\vec{c} + \vec{a}) + \vec{c} \times (\vec{a} + \vec{b}) = \vec{0}$

Taking LHS

$\vec{a} \times (\vec{b} + \vec{c}) + \vec{b} \times (\vec{c} + \vec{a}) + \vec{c} \times (\vec{a} + \vec{b})$

$\vec{a} \times \vec{b} + \vec{a} \times \vec{c} + \vec{b} \times \vec{c} + \vec{b} \times \vec{a} + \vec{c} \times \vec{a} + \vec{c} \times \vec{b}$

$\vec{a} \times \vec{b} + \vec{b} \times \vec{a} + \vec{a} \times \vec{c} + \vec{c} \times \vec{a} + \vec{b} \times \vec{c} + \vec{c} \times \vec{b}$

$$\because \left[\begin{array}{l} \vec{a} \times \vec{b} = -(\vec{b} \times \vec{a}) \\ \vec{a} \times \vec{c} = -(\vec{c} \times \vec{a}) \\ \vec{b} \times \vec{c} = -(\vec{c} \times \vec{b}) \end{array}\right]$$

$\Rightarrow -\cancel{(\vec{b} \times \vec{a})} + \cancel{(\vec{b} \times \vec{a})} - \cancel{(\vec{c} \times \vec{a})} + \cancel{\vec{c} \times \vec{a}}$
$- \cancel{(\vec{c} \times \vec{b})} + \cancel{(\vec{c} \times \vec{b})}$

$\Rightarrow \vec{0}$ (RHS)

Hence prooved

(12)

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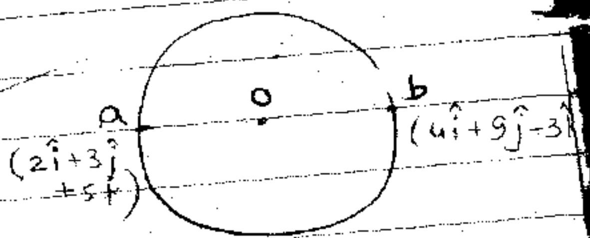
Question No → 14

Solve (14) Vector equation of the sphere when points (2, 3, 5) and (4, 9, -3) are extremities of its diameter.

Given

P.V of a = $2\hat{i}+3\hat{j}+5\hat{k}$

P.V of b = $4\hat{i}+9\hat{j}-3\hat{k}$



B
S
E

We know vector equation of sphere whose end points are given is given by

$$(\bar{r}-\bar{a})\cdot(\bar{r}-\bar{b}) = 0$$

$$\left[\bar{r}-(2\hat{i}+3\hat{j}+5\hat{k})\right]\cdot\left[\bar{r}-(4\hat{i}+9\hat{j}-3k)\right] = 0$$

$$(\vec{r}-2\hat{i}-3\hat{j}-5\hat{k})\cdot(\vec{r}-4\hat{i}-9\hat{j}+3\hat{k}) = 0$$

which is the required vector equation

~~Question~~ 1

Question - NO - 15.

(15) Resolve $\dfrac{13x+18}{2x^2+5x+3}$ into partial fractions

Given $\dfrac{13x+18}{2x^2+5x+3} = \dfrac{13x+18}{(x+1)(2x+3)}$

Let $\dfrac{13x+18}{(x+1)(2x+3)} = \dfrac{A}{(x+1)} + \dfrac{B}{(2x+3)}$ — (1)

$\dfrac{13x+18}{(x+1)(2x+3)} = \dfrac{A(2x+3)+B(x+1)}{(x+1)(2x+3)}$

$13x+18 = A(2x+3) + B(x+1)$

~~Now x = -1, x = -3/2~~

Now $x+1=0 \Rightarrow x=-1$

and $2x+3=0 \Rightarrow x=\dfrac{-3}{2}$.

When $x = -1$

$13(-1)+18 = A(2(-1)+3)$

$-13+18 = A(-2+3)$

$5 = A(1)$

$\boxed{A = 5}$

प्रश्न क्र.

When $x = \frac{-3}{2}$

$$13\left(\frac{-3}{2}\right) + 18 = B\left(\frac{-3}{2} + 1\right)$$

$$\frac{-39}{2} + 18 = B\left(\frac{-1}{2}\right)$$

$$\frac{-39 + 36}{2} = B\left(-\frac{1}{2}\right)$$

$$\frac{+3}{\cancel{2}} = B\left(+\frac{1}{\cancel{2}}\right)$$

$$\boxed{B = 3}$$

Putting the values of A and B in eq-(1)

$$\frac{13x + 18}{(x+1)(2x+3)} = \frac{5}{(x+1)} + \frac{3}{(2x+3)}$$

$$\boxed{\frac{13x + 18}{2x^2 + 5x + 3} = \frac{5}{x+1} + \frac{3}{2x+3}}$$

Question NO - 16

we → 16) To prove that

$$\cos^{-1}\frac{4}{5} + \tan^{-1}\frac{3}{5} = \tan^{-1}\frac{27}{11}$$

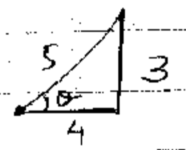
Taking LHS

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

B

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

S



E

$$= \tan^{-1}\left[\frac{3/4 + 3/5}{1 - \frac{3}{4}\times 3/5}\right]$$

$\because \cos^{-1}\frac{4}{5} = \tan^{-1}\frac{3}{4}$

$\therefore$

$$= \tan^{-1}\left[\frac{\frac{15+12}{20}}{\frac{20-9}{20}}\right]$$

$\left[\tan^{-1}(x) + \tan^{-1}(y) = \tan^{-1}\left(\frac{x+y}{1-xy}\right)\right]$

Here $x = 3/4$

$y = 3/5$

$$= \tan^{-1}\left[\frac{27/20}{11/20}\right]$$

$$= \tan^{-1}\left(\frac{27}{11}\right) \text{ (RHS)}$$

Hence LHS = RHS

Hence prooved

प्रश्न क्र.

Question NO - 17

Solve (17) ~~To solve~~

$\frac{dy}{dx} =$

To find differential coefficient of $\sqrt{\tan\sqrt{x}}$

Given $y = \sqrt{\tan\sqrt{x}}$

differentiate with respect to x.

$$\frac{dy}{dx} = \frac{d}{dx}\sqrt{\tan\sqrt{x}}$$

Let $\tan\sqrt{x} = t$

$$\frac{dy}{dx} = \frac{d}{dx}\sqrt{t}$$

$$= \frac{1}{2\sqrt{t}}\frac{d}{dx}(t)$$

$$\frac{dy}{dx} = \frac{1}{2\sqrt{\tan\sqrt{x}}}\frac{d}{dx}\tan\sqrt{x}$$

Let $\sqrt{x} = m$

$$\Rightarrow \frac{dy}{dx} = \frac{1}{2\sqrt{\tan\sqrt{x}}}\frac{d}{dx}\tan m$$

$$= \frac{1}{2\sqrt{\tan\sqrt{x}}} \cdot \sec^2 m \cdot \frac{dm}{dx}$$

(17) [ ] + [ ] = [ ]

योग पृष्ठ ... + पृष्ठ 1/4 के अंक = कुल अंक

$$\frac{dy}{dx} = \frac{1}{2\sqrt{\tan\sqrt{x}}} \cdot \sec^2\sqrt{x} \cdot \frac{d\sqrt{x}}{dx}$$

$$\boxed{\frac{dy}{dx} = \frac{1}{2\sqrt{\tan\sqrt{x}}} \cdot \sec^2\sqrt{x} \cdot \frac{1}{2\sqrt{x}}}$$

$$\left[\because \frac{d}{dx}\sqrt{x} = \frac{1}{2\sqrt{x}}\right.$$
$$\left.\because \frac{d}{dx}\tan x = \sec^2 x\right]$$

Question - 18

Solve - 18

To prove that

$$(1-2y)\frac{dy}{dx} = \sin x$$

Given $y = \sqrt{\cos x + \sqrt{\cos x + \sqrt{\cos x + \cdots \infty}}}$

Then

$y = \sqrt{\cos x + y}$

Squaring both side

(18) [ ] + [ ] = [ ]

पृ० अंक कुल अंक

प्रश्न क्र.

$y^2 = \cos x + y$

Differentiate with respect to x

$\frac{d}{dx} y^2 = \frac{d}{dx} \cos x + \frac{d}{dx} y$

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

$\sin x = \frac{dy}{dx}(1 - 2y)$

$\therefore \cancel{\frac{dy}{dx}} =$

$\therefore \boxed{(1 - 2y)\frac{dy}{dx} = \sin x}$

Hence prooved

$\because \frac{d}{dx} y^2 = 2y \frac{dy}{dx}$

$\because \frac{d}{dx} \cos x = -\sin x$

B
S
E

Question - 19

15)
Given side of a square sheet of metal is increasing at the rate of 5 cm/ ~~sec~~ minute.

Let the side of square sheet be a

$\therefore \frac{da}{dt} = 5 \text{ cm/minute}$

To find $\frac{d}{dt}A$ when the side (a) is 20 cm.

We know Area of square sheet

$A = \text{side} \times \text{side}$

$A = a^2$

$$\therefore \frac{d}{dt}A = \frac{d}{dt}a^2$$

$$= 2a\frac{da}{dt}$$

$$= 2 \times 20 \times 5 \qquad \left[\because a = 20 \text{ cm}, \ \because \frac{da}{dt} = 5 \text{ cm/minute}\right]$$

$$= \boxed{200 \text{ cm}^2/\text{minute}}$$

Hence when side is 20 cm long its area is increasing at the rate of 200 cm²/minute.

$\frac{d}{dt}a$
2 × 20 × 5
200 cm²/m

(20) [ ] + [ ] = [ ]

पृष्ठ 20 के अंक कुल अंक

प्रश्न क.

Question No - 20

Solve:- (20) To find cov(X, Y)

Given

$$\Sigma x_i = 15$$
$$\Sigma y_i = 36$$
$$\Sigma x_i y_i = 110$$
$$n = 5$$

We know that

$$\text{covariance}(X, Y) = \frac{\Sigma xy}{n} - \left(\frac{\Sigma x}{n} \cdot \frac{\Sigma y}{n}\right)$$

$$\text{Cov}(X, Y) = \frac{110}{5} - \left(\frac{15}{5} \times \frac{36}{5}\right)$$

$$= 22 - 3 \times (7.2)$$

$$= 22 - 21.6$$

$$\text{Cov}(X, Y) = \underline{0.4}$$

$$\begin{array}{r} 7.2 \\ \times\ 3 \\ \hline 21.6 \end{array}$$

Question No - 21

To prove correlation coefficient (r) is the geometric mean of the regression coefficients.

To prove $r = \sqrt{b_{yx} \cdot b_{xy}}$

We know that

b_{yx} = regression coefficient of y on x

$$b_{yx} = r \frac{\sigma_y}{\sigma_x} \quad - (1)$$

and regression coefficient of x on y is

$$b_{xy} = r \frac{\sigma_x}{\sigma_y} \quad - (2)$$

Multiplying (1) and (2)

(1) × (2)

$$\Rightarrow b_{xy} \cdot b_{yx} = r^2 \cdot \frac{\cancel{\sigma_y}}{\cancel{\sigma_x}} \times \frac{\cancel{\sigma_x}}{\cancel{\sigma_y}}$$

$$\Rightarrow r^2 = b_{xy} \cdot b_{yx}$$

Taking square root

$$\boxed{r = \sqrt{b_{yx} \cdot b_{xy}}}$$

Hence proved.

22 [ ] + [ ] = [ ]

प्रश्न क्र.

Question No - 22

Solve (22) To prove that the lines

$$\frac{x}{1} = \frac{y-2}{2} = \frac{z+3}{3} \text{ and}$$

$$\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4} \text{ are coplanar}$$

and also find point of intersection of these lines.

Given,
Equations of lines are

$$\frac{x-0}{1} = \frac{y-2}{2} = \frac{z-(-3)}{3} \quad -(1)$$

and $$\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4} \quad -(2)$$

Comparing these lines with general eq of lines, we get

$x_1 = 0$ $\quad y_1 = 2$ $\quad z_1 = -3$

$x_2 = 2$ $\quad y_2 = 6$ $\quad z_2 = 3$

$a_1 = 1$ $\quad b_1 = 2$ $\quad c_1 = 3$

$a_2 = 2$ $\quad b_2 = 3$ $\quad c_2 = 4$

We know if lines are coplanar

$$\begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix} = 0$$

Taking LHS

$$\begin{vmatrix} x_2 - x_1 & y_2 - y_1 & z_2 - z_1 \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

$$= \begin{vmatrix} 2 & 4 & 6 \\ 1 & 2 & 3 \\ 2 & 3 & 4 \end{vmatrix}$$

Expanding with respect to R_1

$= 2(8-9) - 4(4-6) + 6(3-4)$

$= 2(-1) - 4(-2) + 6(-1)$

$= -2 + 8 - 6$

$= 0$ (RHS)

Hence LHS = RHS

$\therefore$ Given lines are coplanar.

For intersecting point
from (1) line

$$\frac{x-0}{1} = \frac{y-2}{2} = \frac{z+3}{3} = k$$

$x = k$, $y = 2k+2$, $z = 3k-3$ — (3)

Which are coordinates of intersecting point

Putting the value of x and y in eq (2)

$$\frac{k-2}{2} = \frac{2k+2-6}{3}$$

$$\frac{k-2}{2} = \frac{2k-4}{3}$$

$3k - 6 = 4k - 8$

$3k - 4k = 6 - 8$

$+k = +2$

$\boxed{k = 2}$

Putting the value of $\boxed{k=2}$ in eq (3)
we get

$x = k = 2$

$y = 2k+2 = 2\times 2 + 2 = 6$

$z = 3\times k - 3 = 3\times 2 - 3 = 3$

$\therefore (x,y,z)$ or its intersecting points is $(2,6,3)$

माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल 4 पृष्ठीय

परीक्षार्थी द्वारा भरा जावे

परीक्षा का विषय .... विषय कोड : परीक्षा का माध्यम परीक्षा का दिनांक 18 | 03 | 2017

[redacted]

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा
हायर सेकेण्डरी सर्टी॰ परीक्षा
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पर्यवेक्षक का नाम एवं हस्ताक्षर

केन्द्राध्यक्ष / सहायक केन्द्राध्यक्ष के हस्ताक्षर

मुख्य उत्तर पुस्तिका के अंतिम पृष्ठ क्रमांक..........तक कुल प्राप्तांक ☐ + ☐ = ☐

Question No - 23.

Ans (23) To prove $f(a) + f(b) = f\left(\frac{a+b}{1+ab}\right)$

Given
$$f(x) = \log_e\left(\frac{1-x}{1+x}\right)$$

Taking LHS

$f(a) + f(b)$

Now

$$f(a) = \log_e\left(\frac{1-a}{1+a}\right) \quad -(1)$$

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(2) [6] + [—] = [ ]

पृष्ठ 2 के अंक   कुल अंक

प्रश्न क्र.

$$f(b) = \log_e\left(\frac{1-b}{1+b}\right) \quad - (2)$$

Adding (1) + (2)

$$f(a) + f(b) = \log_e\left(\frac{1-a}{1+a}\right) + \log_e\left(\frac{1-b}{1+b}\right)$$

$$= \log_e\left(\frac{1-a}{1+a} \times \frac{1-b}{1+b}\right)$$

$$= \log_e\left(\frac{(1-a)(1-b)}{(1+a)(1+b)}\right)$$

$$f(a)+f(b) = \log_e\left(\frac{1-b-a+ab}{1+a+b+ab}\right) \quad - (3)$$

B
S
E

Taking RHS

$$f\left(\frac{a+b}{1+ab}\right) = \log_e\left[\frac{1-\left(\frac{a+b}{1+ab}\right)}{1+\left(\frac{a+b}{1+ab}\right)}\right]$$

$$= \log_e\left[\frac{\frac{1+ab-a-b}{1+ab}}{\frac{1+ab+a+b}{1+ab}}\right]$$

$$f\left(\frac{a+b}{1+ab}\right) = \log_e\left[\frac{1-a-b+ab}{1+a+b+ab}\right] \quad (4)$$

3

योग पूर्व पृष्ठ + पृष्ठ 3 के अंक = कुल अंक

प्रश्न क्र.

from (3) and (4)

$$\boxed{f(a) + f(b) = f\left(\frac{a+b}{1+ab}\right)}$$

Hence proved.

Question No - 24

24

To prove that

$$\int_0^{\frac{\pi}{2}} \frac{\sqrt{\tan x}}{1+\sqrt{\tan x}}\, dx = \pi/4$$

Taking LHS

$$\text{Let } I = \int_0^{\pi/2} \frac{\sqrt{\tan x}}{1+\sqrt{\tan x}}\, dx$$

$$I = \int_0^{\pi/2} \left[\frac{\frac{\sqrt{\sin x}}{\sqrt{\cos x}}}{1+\frac{\sqrt{\sin x}}{\sqrt{\cos x}}}\right] dx$$

4

प्रश्न क्र.

$$I = \int_0^{\pi/2} \frac{\sqrt{\sin x}/\sqrt{\cos x}}{\frac{\sqrt{\cos x} + \sqrt{\sin x}}{\sqrt{\cos x}}} dx$$

$$I = \int_0^{\pi/2} \frac{\sqrt{\sin x}}{\sqrt{\cos x} + \sqrt{\sin x}} dx \quad \text{--- (1)}$$

Now $\left[\because \int_0^a f(x)dx = \int_0^a f(a-x)dx\right]$

$$I = \int_0^{\pi/2} \frac{\sqrt{\sin(\pi/2 - x)}}{\sqrt{\cos(\pi/2 - x)} + \sqrt{\sin(\pi/2 - x)}} dx$$

Here $a = \pi/2$

$$I = \int_0^{\pi/2} \frac{\sqrt{\cos x}}{\sqrt{\sin x} + \sqrt{\cos x}} \quad (2)$$

Adding (1) and (2)

(1 + 2) =>

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

$$2I = \int_0^{\pi/2} 1 \, dx \qquad \int 1\, dx = x$$

$$2I = [x]_0^{\pi/2}$$

$$2I = \frac{\pi}{2}$$

$$\boxed{I = \pi/4}$$

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माध्यमिक शिक्षा मण्डल, मध्यप्रदेश, भोपाल 4 पृष्ठीय

परीक्षार्थी द्वारा भरा जावे

परीक्षा का विषय | विषय कोड | परीक्षा का माध्यम | परीक्षा का दिनांक 18 03 2017

[redacted]

परीक्षा का नाम एवं परीक्षा केन्द्र क्रमांक की मुद्रा

हायर सेकेण्डरी सर्टी॰ परीक्षा

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पर्यवेक्षक का नाम एवं हस्ताक्षर

केन्द्राध्यक्ष / सहायक केन्द्राध्यक्ष के हस्ताक्षर

उत्तर पुस्तिका के अंतिम पृष्ठ क्रमांक..........तक कुल प्राप्तांक ☐ + ☐ = ☐

$$\therefore \boxed{\int_0^{\pi/2} \frac{\sqrt{\tan x}}{1+\sqrt{\tan x}} = \pi/4}$$

Hence prooved.

Question No - 25.

(25) Given $\frac{dy}{dx} = \frac{x^2 + 5xy + 4y^2}{x^2}$ — (1)

which is a homogenous equation in degree - 2.

Let $y = vx \Rightarrow v = y/x$

Differentiate with respect to x.

$\frac{dy}{dx} = v + x\frac{dv}{dx}$ — (2)

प्रश्न क्र.

from ①

$$\frac{dy}{dx} = \frac{x^2 + 5x(vx) + 4v^2x^2}{x^2}$$

$$v + x\frac{dv}{dx} = \frac{x^2 + 5vx^2 + 4v^2x^2}{x^2}$$

$$v + x\frac{dv}{dx} = 1 + 5v + 4v^2$$

$$x\frac{dv}{dx} = 1 + 5v + 4v^2 - v$$

$$x\frac{dv}{dx} = 4v^2 + 4v + 1$$

$$x\frac{dv}{dx} = (2v+1)^2$$

$$\frac{dv}{(2v+1)^2} = \frac{dx}{x}$$

$4v^2 + 4v + 1$

$\int (2v+1)^{-2} dv$

$\frac{1}{2}(2v+1)$

Variables are separable.

∴ Integration both side

$$\int \frac{dv}{(2v+1)^2} = \int \frac{dx}{x} + c$$

$$\int \frac{dv}{(2v+1)^2} = \log_e x + c$$

श्न क्र.

Now let $2v+1 = t$

Differentiating with respect to v.

$$2\frac{dv}{dv} + \frac{d}{dv}(1) = \frac{dt}{dv}$$

$$2 + 0 = \frac{dt}{dv}$$

$$2\,dv = dt$$

$$\boxed{dv = dt/2}$$

$$\frac{1}{2}\int \frac{1}{t^2}\,dt = \log_e x + c$$

$$\frac{1}{2}\int t^{-2}\,dt = \log_e x + c$$

$$-\frac{1}{2}(t^{-1}) = \log_e x + c$$

$$-\frac{1}{2}\left(\frac{1}{2v+1}\right) = \log_e x + c$$

$$-\frac{1}{2}\left(\frac{1}{2(y/x)+1}\right) = \log_e x + c \qquad [v = y/x]$$

$$-\frac{1}{2}\left(\frac{x}{2y+x}\right) = \log_e x + c$$

$$\frac{-x}{2(2y+x)} = \log_e x + c$$

which is the solution of the given differential equation.

(4) [ ] + [ ] = [ ]

योग पूर्व पृष्ठ   पृष्ठ 4 के अंक   कुल अंक

प्रश्न क्र.

Question - (26)

Solve - (26) Given

a card is drawn at random from a well shuffled pack of 52 cards.

To find that it is neither an ace nor a king

Let $P(A)$ denote it is neither an ace nor a king.

Then $P(\bar{A})$ denote it is either an ace or a king.

If it is either an ace or a king

$n(\bar{A}) = 8$

and $n(S) = 52$

$P(\bar{A}) = \frac{n(\bar{A})}{n(S)}$

$P(\bar{A}) = \frac{8}{52}$

$\therefore P(A) = 1 - P(\bar{A})$

$= 1 - \frac{8}{52}$

$= \frac{52 - 8}{52} = \frac{44}{52} = \frac{11}{13}$

$\therefore P(A) = \frac{11}{13}$

$\therefore$ Probability that it is neither an ace nor king

$P(A) = \left(\frac{11}{13}\right)$