SET-1

Kendriya Vidyalaya Sangathan Varanasi Region

Pre-Board Examination-1, 2024-25

Marking Scheme

SECTION-A

1.	**D**	**[01]**
2.	**A**	**[01]**
3.	**D**	**[01]**
4.	**D**	**[01]**
5.	**C**	**[01]**
6.	**B**	**[01]**
7.	**C**	**[01]**
8.	**A**	**[01]**
9.	**A**	**[01]**
10.	**B**	**[01]**
11.	**B**	**[01]**
12.	**C**	**[01]**
13.	**D**	**[01]**
14.	**C**	**[01]**
15.	**B**	**[01]**
16.	**A**	**[01]**
17.	**D**	**[01]**
18.	**C**	**[01]**
19.	**D**	**[01]**
20.	**A**	**[01]**

SECTION-B

21. $\tan^{-1}[2\sin(2 \times \frac{\pi}{6})]$ **[1/2]**

$= \tan^{-1}(2 \times \frac{\sqrt{3}}{2})$ **[01]**

$= \frac{\pi}{3}$ **[1/2]**

22. $\frac{dx}{dt} = 10(1-\cos t)$ **[1/2]**

$\frac{dy}{dt} = 12\sin t$ **[1/2]**

$\frac{dy}{dx} = \frac{6}{5}\cot\frac{t}{2}$ **[1/2]**

$\frac{dy}{dx}\Big]_{t=\frac{2\pi}{3}} = \frac{6}{5\sqrt{3}}$ **[1/2]**

OR

$\frac{d}{dx}(\sin^{-1}x^2) = \frac{1}{\sqrt{1-(x^2)^2}}\frac{d(x^2)}{dx}$ **[01]**

$= \frac{2x}{\sqrt{1-x^4}}$ **[01]**

23. $\int \frac{\cos x+\sin x}{\cos x-\sin x}$ dx **[1/2]**

= $-\int \frac{1}{t}$ dt let t = cos x -sin x **[1/2]**

= -log (t) + C **[1/2]**

= -log $|cosx - sinx|$ **[1/2]**

24. $\frac{dy}{dx} + \frac{2}{x}y$= x **[1/2]**

I.F. = $e^{\int \frac{2}{x} dx}$ **[1/2]**

= $e^{2 \log x}$ **[1/2]**

= x^2 **[1/2]**

25. D R′s are 3, -2,8 **[01]**

D C′s are $\frac{3}{\sqrt{77}}, \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}}$ **[01]**

OR

$\frac{x+2}{3} = \frac{y-4}{-5} = \frac{z+5}{6}$ **[02]**

SECTION-C

26. F′(x) = $3x^2$-24x+36 **[1/2]**

3(x-2)(x-6)= 0 **[1/2]**

X =2, x= 6 **[1/2]**

(-∞, 2), (6,∞) increasing **[01]**

(2, 6) decreasing **[1/2]**

27. = $-\int \frac{1}{(1-t)(2-t)}$ dt **[01]**

= $-\int \frac{1}{1-t}\, dt + \int \frac{1}{2-t}\, dt$ **[01]**

= log $\left|\frac{1-cosx}{2-cosx}\right|$ + C **[01]**

OR

I = $\int_0^{\pi} \frac{\pi-x}{a^2cos^2(\pi-x)+b^2sin^2(\pi-x)}$ dx **[1/2]**

I = $\int_0^{\pi} \frac{(\pi-x)}{a^2cos^2x+ b^2sin^2x}$ dx **[1/2]**

I = $\frac{\pi}{ab}\left[tan^{-1}(\frac{b\ tanx}{a})\right]_0^{\frac{\pi}{2}}$ **[01]**

= $\frac{\pi^2}{2ab}$ **[01]**

28. $\frac{dy}{dx} = \frac{y+\sqrt{x^2+ y^2}}{x}$ **[1/2]**

put y = v x, $\frac{dy}{dx}$ = v + $x\frac{dv}{dx}$ **[1/2]**

v + $x\frac{dv}{dx} = \frac{vx+ \sqrt{x^2+x^2v^2}}{x}$ **[1/2]**

$\int \frac{1}{\sqrt{1+v^2}}\, dv = \int \frac{dx}{x}$ **[1/2]**

$\log(v + \sqrt{1 + v^2}) = \log x + \log C$ **[1/2]**

$y + \sqrt{x^2 + y^2} = Cx^2$ **[1/2]**

29. $\vec{a} + \vec{b} = 2\hat{\imath} + 3\hat{\jmath} + 4\hat{k}$ **[1/2]**

$\vec{a} - \vec{b} = -\hat{\jmath} - 2\hat{k}$ **[1/2]**

$(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b}) = -2\hat{\imath} + 4\hat{\jmath} - 2\hat{k}$ **[01]**

Required vector = $\frac{6}{\sqrt{24}}(-2\hat{\imath} + 4\hat{\jmath} - 2\hat{k})$ **[01]**

OR

$\overrightarrow{AB} = -\hat{\imath} - 2\hat{y} - 6\hat{k}$

$\overrightarrow{AC} = \hat{\imath} - 3\hat{\jmath} - 5\hat{k}$ **[01]**

$\overrightarrow{BC} = 2\hat{\imath} - \hat{\jmath} + \hat{k}$

$\overrightarrow{AC}.\overrightarrow{BC} = 2 + 3 - 5 = 0$ **[1/2]**

$\overrightarrow{AC} \perp \overrightarrow{BC}$

Area = $\frac{1}{2}\left|\overrightarrow{AC} \times \overrightarrow{BC}\right|$ **[1/2]**

$= \frac{1}{2}\left|(-8\hat{\imath} - 11\hat{\jmath} + 5\hat{k})\right|$

$= \frac{1}{2}\sqrt{64 + 121 + 25}$

$= \frac{\sqrt{210}}{4}$ sq. unit **[01]**

30. Correct graph **[01]**

Corner points (5, 5) (15, 15) (0, 20) and (0, 10) **[01]**

min Z at (5, 5)

min Z = 60

max Z at all points lie on the line segment joining points (15, 15) and (0, 20)

max Z = 180 **[01]**

31. X: no. of kings

X = 0, 1, 2 **[1/2]**

[02]

X	0	1	2
P(X)	$\frac{188}{221}$	$\frac{32}{221}$	$\frac{1}{221}$
XP(X)	0	$\frac{32}{221}$	$\frac{2}{221}$

Mean = $\mu = \Sigma XP(X) = \frac{2}{13}$ **[1/2]**

OR

(i) K = $\frac{1}{10}$ **[01]**

(ii) $\frac{3}{10}$ **[01]**

(iii) $\frac{3}{10}$ **[01]**

SECTION-D

32. u= $(\sin x)^x$, log u = x log sin x **[01]**

$\frac{du}{dx} = (\sin x)^x [\log \sin x + x \cot x]$ **[02]**

v= $\sin^{-1}\sqrt{x}$

$\frac{dv}{dx} = \frac{1}{\sqrt{1-x}} \times \frac{1}{2\sqrt{x}}$ **[01]**

$\frac{dy}{dx} = (\sin x)^x [x \cot x + \log \sin x] + \frac{1}{2\sqrt{x-x^2}}$ **[01]**

OR

$y_1 = \frac{\text{Cos}(\log x)}{x}$ **[01]**

$xy_1 = \cos(\log x)$ **[01]**

$xy_2 + y_1 = \frac{-\sin(\log x)}{x}$ **[01]**

$x^2y_2 + xy_1 = -y$ **[01]**

$x^2y_2 + xy_1 + y = 0$ **[01]**

33. $\overrightarrow{a_1} = \hat{\imath} + \hat{\jmath} - \hat{k}$ $\overrightarrow{b_1} = 3\hat{\imath} - \hat{\jmath}$

$\overrightarrow{a_2} = 4\hat{\imath} - \hat{k}$ $\overrightarrow{b_2} = 2\hat{\imath} + 3\hat{k}$ **[01]**

$\overrightarrow{a_2} - \overrightarrow{a_1} = 3\hat{\imath} - \hat{\jmath}$ **[1/2]**

$\overrightarrow{b_1} \times \overrightarrow{b_2} = -3\hat{\imath} - 9\hat{\jmath} + 2\hat{k}$ **[1/2]**

$(\overrightarrow{a_2} - \overrightarrow{a_1}).\ (\overrightarrow{b_1} \times \overrightarrow{b_2}) = -9+9+0$ **[1/2]**

$= 0$

$\therefore$ lines are coplanar and $\overrightarrow{b_1} \times \overrightarrow{b_2} \neq 0$ **[1/2]**

So, lines are intersecting.

$\vec{r} = (1+3\lambda)\hat{\imath} + (1-\lambda)\hat{\jmath} - \hat{k}$

$\vec{r} = (4+2\mu)\hat{\imath} + (-1+3\mu)\hat{k}$

$\therefore$ $1-\lambda=0$, $-1=-1+3\mu$

$\lambda = 1$, $\mu = 0$ **[01]**

and $1+3\lambda = 4+2\mu$

$4 = 4$ is true

vector of point of intersection as $\vec{r} = 4\hat{\imath} - \hat{k}$

or (4, 0, -1) **[01]**

OR

General point on the line

$\frac{x-11}{10} = \frac{y+2}{-4} = \frac{z+8}{-11} = \lambda\ (say)$

is $(10\lambda + 11, -4\lambda - 2, -11\lambda - 8)$ **[01]**

R's of required perpendicular

$10\lambda + a, -4\lambda - 1, -11\lambda - 13$ **[01]**

DR's of given line 10, −4, −11

$\therefore 10(10\lambda + a) - 4(-4\lambda - 1) - 11(-11\lambda - 13) = 0$ **[01]**

$$\lambda = -1$$

∴ Foot of perpendicular (1, 2, 3) **[01]**

Length of perpendicular = $\sqrt{(2-1)^2 + (-1-2)^2 + (5-3)^2}$

$= \sqrt{14}$ **[01]**

34. Consider corresponding equations

For figure 1M

$\{(x,y):\ x^2+y^2 \le 16\ ,\ \ y^2=6x\}$

Above region has a circle $x^2+y^2=16$ of centre (0,0) and radius 4

And a parabola $y^2=6x$ whose vertex is (0,0) and and axis along x axis

To find the point of intersection

Consider the equations $x^2+y^2=16$

$y^2=6x$

When x=2 , y= $\pm 2\sqrt{3}$ 1M

$=2[\int_0^2 ydx(parabola) + \int_2^4 ydx(circle)]$ 2

solving the above we get

$(\frac{4\sqrt{3}}{3} + \frac{16\pi}{3})$ square unit 2

35. $3x + 2y + z = 1600$

$4x + y + 3z = 2300$

$x + y + z = 900$ **[01]**

$A = \begin{bmatrix} 3 & 2 & 1 \\ 4 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix} \qquad B = \begin{bmatrix} 1600 \\ 2300 \\ 900 \end{bmatrix}$ **[1/2]**

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

$|A| = -5$ **[01]**

$\text{adj } A = \begin{bmatrix} -2 & -1 & 5 \\ -1 & 2 & -5 \\ 3 & -1 & -5 \end{bmatrix}$ **[01]**

$X = \frac{(adj\ A)B}{|A|}$ **[1/2]**

$\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 200 \\ 300 \\ 400 \end{bmatrix}$ **[01]**

x = 200,   y = 300,   z = 400

SECTION-E

36. (i) R is an equivalence relation. **[01]**

(ii) for Correct Proof. **[01]**

(iii) for correct for Proof of one-one for onto **[02]**

OR

find, Range = R **[02]**

37. (i) $v = \pi r^2 h$

$h = \frac{432}{r^2}$ **[01]**

(ii) T.S.A $= 2\pi r\left(\frac{432}{r^2} + r\right)$

$S = \frac{864\pi}{r} + 2\pi r^2$ **[01]**

(iv) $\frac{ds}{dr} = \frac{-864\pi}{r^2} + 4\pi r$

for, $\frac{ds}{dr} = 0$

r = 6

$\frac{d^2s}{dr^2} = \frac{1728\,\pi}{r^3} + 4\pi$

$\frac{d^2s}{dr^2} > 0$

∴ r = 6 unit is minimum radius. **[02]**

OR

minimum surface area = 216π sq. unit **[02]**

38.(i) $P(E) = P(E_1)\,P(E/E_1) + P(E_2)\,P(E/E_2) + P(E_3)\,P(E/E_3)$ **[02]**

$= 0.4 \times 0.06 + 0.3 \times 0.04 + 0.3 \times 0.03$

$= 0.024 + 0.012 + 0.009 = 0.045.$

(ii) $P(E_1/E) = \frac{P(E_1)\,P(E/E_1)}{0.045} = \frac{0.024}{0.045} = \frac{8}{15}$ **[02]**