

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]
$\left. \frac{dy}{dx} \right]_{t=\frac{2\pi}{3}} = \frac{6}{5\sqrt{3}}$	[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]

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

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

$$= -\log(t) + C \quad [1/2]$$

$$= -\log |\cos x - \sin x| \quad [1/2]$$

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

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

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

$$= x^2 \quad [1/2]$$

$$25. \text{ D R's are } 3, -2, 8 \quad [01]$$

$$\text{D C's are } \frac{3}{\sqrt{77}}, \frac{-2}{\sqrt{77}}, \frac{8}{\sqrt{77}} \quad [01]$$

OR

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

SECTION-C

$$26. F'(x) = 3x^2 - 24x + 36 \quad [1/2]$$

$$3(x-2)(x-6) = 0 \quad [1/2]$$

$$X=2, x=6 \quad [1/2]$$

$$(-\infty, 2), (6, \infty) \text{ increasing} \quad [01]$$

$$(2, 6) \text{ decreasing} \quad [1/2]$$

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

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

$$= \log \left| \frac{1-\cos x}{2-\cos x} \right| + C \quad [01]$$

OR

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

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

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

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

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

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

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

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

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

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

$$29. \vec{a} + \vec{b} = 2\hat{i} + 3\hat{j} + 4\hat{k} \quad [1/2]$$

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

$$(\vec{a} + \vec{b}) \times (\vec{a} - \vec{b}) = -2\hat{i} + 4\hat{j} - 2\hat{k} \quad [01]$$

$$\text{Required vector} = \frac{6}{\sqrt{24}}(-2\hat{i} + 4\hat{j} - 2\hat{k}) \quad [01]$$

OR

$$\overrightarrow{AB} = -\hat{i} - 2\hat{j} - 6\hat{k}$$

$$\overrightarrow{AC} = \hat{i} - 3\hat{j} - 5\hat{k} \quad [01]$$

$$\overrightarrow{BC} = 2\hat{i} - \hat{j} + \hat{k}$$

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

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

$$\text{Area} = \frac{1}{2} |\overrightarrow{AC} \times \overrightarrow{BC}| \quad [1/2]$$

$$= \frac{1}{2} |(-8\hat{i} - 11\hat{j} + 5\hat{k})|$$

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

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

$$30. \text{Correct graph} \quad [01]$$

$$\text{Corner points } (5, 5) (15, 15) (0, 20) \text{ and } (0, 10) \quad [01]$$

$$\text{min } Z \text{ at } (5, 5)$$

$$\text{min } Z = 60$$

$$\text{max } Z \text{ at all points lie on the line segment joining points } (15, 15) \text{ and } (0, 20)$$

$$\text{max } Z = 180 \quad [01]$$

$$31. X: \text{no. of kings}$$

$$X = 0, 1, 2 \quad [1/2]$$

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

[02]

$$\text{Mean} = \mu = \sum XP(X) = \frac{2}{13} \quad [1/2]$$

OR

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

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

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

SECTION-D

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

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

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

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

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

OR

$$y_1 = \frac{\cos(\log x)}{x} \quad [01]$$

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

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

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

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

$$33. \vec{a}_1 = \hat{i} + \hat{j} - \hat{k} \quad \vec{b}_1 = 3\hat{i} - \hat{j}$$

$$\vec{a}_2 = 4\hat{i} - \hat{k} \quad \vec{b}_2 = 2\hat{i} + 3\hat{k} \quad [01]$$

$$\vec{a}_2 - \vec{a}_1 = 3\hat{i} - \hat{j} \quad [1/2]$$

$$\vec{b}_1 \times \vec{b}_2 = -3\hat{i} - 9\hat{j} + 2\hat{k} \quad [1/2]$$

$$(\vec{a}_2 - \vec{a}_1) \cdot (\vec{b}_1 \times \vec{b}_2) = -9 + 9 + 0 = 0 \quad [1/2]$$

$$\therefore \text{lines are coplanar and } \vec{b}_1 \times \vec{b}_2 \neq 0 \quad [1/2]$$

So, lines are intersecting.

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

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

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

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

$$\text{and } 1 + 3\lambda = 4 + 2\mu$$

$$4 = 4 \text{ is true}$$

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

$$\text{or } (4, 0, -1) \quad [01]$$

OR

General point on the line

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

$$\text{is } (10\lambda + 11, -4\lambda - 2, -11\lambda - 8) \quad [01]$$

R's of required perpendicular

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

DR's of given line 10, -4, -11

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

$$\lambda = -1$$

$$\therefore \text{Foot of perpendicular } (1, 2, 3) \quad [01]$$

$$\begin{aligned} \text{Length of perpendicular} &= \sqrt{(2-1)^2 + (-1-2)^2 + (5-3)^2} \\ &= \sqrt{14} \end{aligned} \quad [01]$$

34. Consider corresponding equations

For figure 1M

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

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 axis along x axis

To find the point of intersection

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

$$y^2 = 6x$$

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

$$= 2 \left[\int_0^2 y dx (\text{parabola}) + \int_2^4 y dx (\text{circle}) \right] \quad 2$$

solving the above we get

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

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

$$4x + y + 3z = 2300$$

$$x + y + z = 900 \quad [01]$$

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

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

$$|A| = -5 \quad [01]$$

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

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

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

$$x = 200, \quad y = 300, \quad z = 400$$

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) $v = \pi r^2 h$

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

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

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

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

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

$$r = 6$$

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

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

$\therefore r = 6$ 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]