KENDRIYA VIDYALAYA SANGATHAN HYDERABAD REGION
SECOND PRE-BOARD EXAMINATION 2025-26
SET-2

MARKING SCHEME

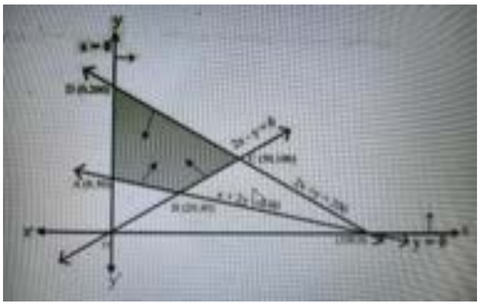
CLASS XII **SUBJECT:- MATHEMATICS(041)**

1	2	3	4	5	6	7	8	9	10
B	D	C	C	A	A	B	B	A	D

11	12	13	14	15	16	17	18	19	20
B	C	B	D	A	B	D	D	C	C

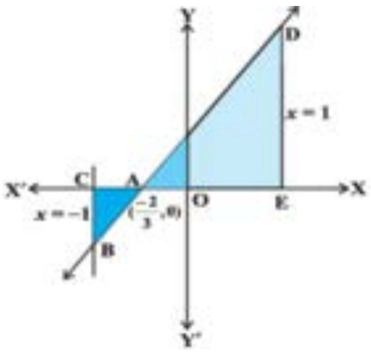
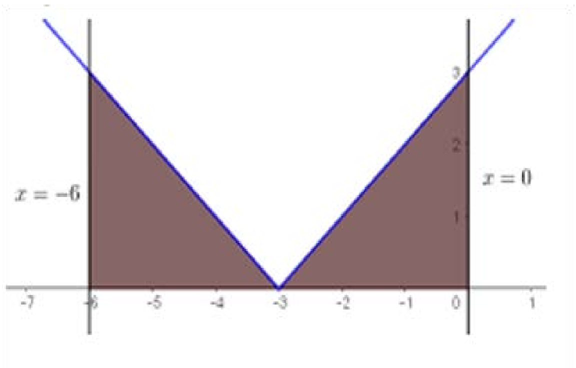
Q.No.	EXPECTED ANSWER OR VALUE POINTS	Marks
21	$\int e^x \frac{1+x-1}{(1+x)^2}dx$ $\int e^x \left[\frac{1}{1+x} - \frac{1}{(1+x)^2}\right]dx$ $= e^x\left(\frac{1}{1+x}\right) + c$	½ ½ 1
	OR For splitting For getting answer 3	 1 1
22	If 'f' is continuous at $x = 0$, then limit $f(x) = f(0)$ Getting $k = 1, -1$	1 1
23	Finding $\frac{d\,(tan^{-1}x)}{dx} = \frac{1}{1+x^2}$ and $\frac{d(\,logx)}{dx} = \frac{1}{x}$ then $\frac{d\,(tan^{-1}x)}{d\,(logx)} = \frac{x}{1+x^2}$	1 1
24	Given $f(x) = \sin^{-1}\left(x^2 - 4\right)$ $-1 \le x^2 - 4 \le 1$ $3 \le x^2 \le 5$ $x \in \left[-\sqrt{5}, -\sqrt{3}\right] \cup \left[\sqrt{3}, \sqrt{5}\right]$ Domain of $f(x)$ *is* $\left[-\sqrt{5}, -\sqrt{3}\right] \cup \left[\sqrt{3}, \sqrt{5}\right]$ **OR** For simplification For getting $k = \frac{1}{2}$	½ ½ 1 1 1
25	$\lvert 3\vec{a} - 2\vec{b} + 2\vec{c}\rvert = \sqrt{(3\vec{a} - 2\vec{b} + 2\vec{c}).(3\vec{a} - 2\vec{b} + 2\vec{c})}$ Given $\vec{a} . \vec{b} = \vec{a} . \vec{c}$ and $\vec{b} . \vec{c} = 0$ applying the dot product $\lvert 3\vec{a} - 2\vec{b} + 2\vec{c}\rvert = \sqrt{61}$	1 ½ ½

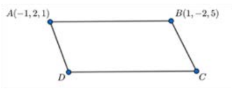
26	The feasible region determined by the constraints, $x + 2y \geq 100, 2x - y \leq 0, 2x + y \leq 200, x, y \geq 0$ is as shown The corner points of feasible region are A(0, 50), B(20, 40), C(50, 100) and D(0, 200) The value of Z at these corner points as follows The minimum value of Z is 100 at all the points on the line segment joining the points A(0, 50) and (20, 40).	1½ for correct graph and correct feasible region 1½



Corner points	Value of the objective function, Z = x + 2y
A(0, 50)	100
B(20, 40)	100
C(50,100)	250
D(0, 200)	400

Q.No.	**EXPECTED ANSWER OR VALUE POINTS**	Marks
27	$\frac{dx}{dt}$ = a e^t(sint + cos t) - a e^t(sint - cos t),	1
	$\frac{dy}{dt}$ = a e^t(sint + cos t) + a e^t(sint - cos t)	1
	$\frac{dy}{dx} = (\frac{dy}{dt}) \div \frac{dx}{dt} = \frac{x+y}{x-y}$	1
	OR	
	Given y = x^x taking log on both sides	1
	We get (1/y) $\frac{dy}{dx}$ = 1 + log x $\rightarrow$ $\frac{dy}{dx}$ = y(1+log x)	1
	Further deriving we get $\frac{d^2y}{dx^2} - \frac{1}{y}(\frac{dy}{dx})^2 - \frac{y}{x} = 0$	1
28	Finding $f'(x) = 4x^3 - 4x^2$	1
	and for finding critical points x= 0, x = 1	1
	Checking $f^1(x) > 0$, when $x \in (1, \infty)$	1
29	$\frac{1-x}{3} = \frac{7y-14}{2p} = \frac{z-3}{2}$ and $\frac{7-7x}{3p} = \frac{y-5}{1} = \frac{6-z}{5}$	
	$\Rightarrow \frac{x-1}{-3} = \frac{y-2}{2p/7} = \frac{z-3}{2}$ and $\frac{x-1}{-3p/7} = \frac{y-5}{1} = \frac{z-6}{-5}$	1
	Two lines are perpendicular $\Rightarrow a_1a_2 + b_1b_2 + c_1c_2 = 0$	
	$\Rightarrow (-3)\left(-\frac{3p}{7}\right) + \left(\frac{2p}{7}\right)(1) + (2)(-5) = 0$	1
	$\Rightarrow \frac{9p}{7} + \frac{2p}{7} - 10 = 0$	
	$\Rightarrow$ p = 70/11	1
	OR	
	The general point on first line is P = $(3\lambda - 1,\ 5\lambda - 3, 7\lambda - 5)$	

	The general point on second line is Q = $(\mu+2,\ 3\mu+4, 5\mu+6)$ For intersecting, $(3\lambda-1,\ 5\lambda-3, 7\lambda-5) = (\mu+2,\ 3\mu+4, 5\mu+6)$ For finding $\lambda = \frac{1}{2}$ $\ and\ \mu = -\frac{3}{2}$ Finding the point of intersection $(\frac{1}{2}, -\frac{1}{2}, -\frac{3}{2})$	1 1 1
30	$$P(A) = \frac{4}{5}, P(B) = \frac{3}{4}, P(C) = \frac{2}{3}$$ $$P(A') = \frac{1}{5}, P(B') = \frac{1}{4}, P(C') = \frac{1}{3}$$ (i) $P(A \cap B \cap C) = P(A)P(B)P(C) = \frac{4}{5}\times\frac{3}{4}\times\frac{2}{3} = \frac{24}{60} = \frac{2}{5}$ (ii)P(Exactly 2) $= \left(\frac{4}{5}\times\frac{3}{4}\times\frac{1}{3}\right) + \left(\frac{4}{5}\times\frac{2}{3}\times\frac{1}{4}\right) + \left(\frac{3}{4}\times\frac{2}{3}\times\frac{1}{5}\right)$ $= \frac{12}{60} + \frac{8}{60} + \frac{6}{60} = \frac{26}{60} = \frac{13}{30}$	1 1 1
31	Correct figure Finding $x = -\frac{2}{3}$ Writing Area = $\left\vert\int_{-1}^{-\frac{2}{3}}(3x+2)dx\right\vert +$ $\int_{-\frac{2}{3}}^{1}(3x+2)dx$ Integrating Finding final answer as $\frac{1}{6} + \frac{25}{6} = \frac{13}{3}$  **OR** Figure Required Area $= \int_{-6}^{0} y\ dx$ $=2\int_{-3}^{0} x+3\ dx$ $=2\left.\frac{(x+3)^2}{2}\right]_{-3}^{0}$ =9  	1 1 1 1 1 1
Q.No.	**EXPECTED ANSWER OR VALUE POINTS**	Marks
32	Let the number of chairs , tables and beds produced be $x, y\ and\ z\ respectively$ $x + y + z = 45, -x + 0.y + z = 8, x - 2y + z = 0$ Finding $\vert A\vert = 6 \neq 0$ AX=B ⇒ $X = A^{-1}B$	1 ½ 2

	finding $A^{-1} = \frac{1}{6}\begin{bmatrix} 2 & -3 & 1 \\ 2 & 0 & -2 \\ 2 & 3 & 1 \end{bmatrix}$ $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 11 \\ 15 \\ 19 \end{bmatrix}$	$1\frac{1}{2}$
33	d. r's of CD are $<1, -2, 2>$, $\therefore$ $d.r's\ of$ AB $are < 1, -2, 2 >$ $\therefore$ Equation of $AB\ is \frac{x+1}{1} = \frac{y-2}{-2} = \frac{z-1}{2}$  $\therefore$ Equation of $CD\ is \frac{x-4}{1} = \frac{y+7}{-2} = \frac{z-8}{2}$ Let $\vec{a_1} = -\hat{\imath} + 2\hat{\jmath} + \hat{k}$, $\vec{a_2} = 4\hat{\imath} - 7\hat{\jmath} + 8\hat{k}$ and $\vec{b} = \hat{\imath} + 2\hat{\jmath} - 2\hat{k}$ $\vec{a_2} - \vec{a_1} = 5\hat{\imath} - 9\hat{\jmath} + 7\hat{k}$ $(\vec{a_2} - \vec{a_1}) \times \vec{b} = \begin{vmatrix} \hat{\imath} & \hat{\jmath} & \hat{k} \\ 5 & -9 & 7 \\ 1 & -2 & 2 \end{vmatrix} = -4\hat{\imath} - 3\hat{\jmath} - \hat{k}$ Distance between AB and CD is given by $d = \frac{\|(\vec{a_2} - \vec{a_1}) \times \vec{b}\|}{\|\vec{b}\|}$ $d = \frac{\sqrt{16+9+1}}{\sqrt{1+4+4}} = \frac{\sqrt{26}}{3}$ CD= $\sqrt{2^2 + (-4)^2 + 4^2} = 6$ Area of parallelogram ABCD =$b \times h = 6 \times \frac{\sqrt{26}}{3} = 2\sqrt{26}$	½ ½ 1 ½ 1 ½ 1
34	Given diff. equation is $\frac{dy}{dx} = \frac{2ye^{y/x} - x}{2xe^{y/x}}$ Put, $\frac{y}{x} = v \Rightarrow \frac{dy}{dx} = v + x\frac{dv}{dx}$ $\therefore \quad v + x\frac{dv}{dx} = \frac{2ve^v - 1}{2e^v}$ $\Rightarrow x\frac{dv}{dx} = \frac{2ve^v - 1}{2e^v} - v = -\frac{1}{2e^v}$ $\Rightarrow 2e^v dv = -\frac{dx}{x}$ Integrating to get, $2e^v = -\log\|x\| + C$ $\Rightarrow 2e^{y/x} + \log\|x\| = C$	1 1 1 1 1
	OR	
	$(x^2-1)\frac{dy}{dx} + 2xy = \frac{2}{x^2-1}$ Integral factor is $e^{\int\frac{2x}{x^2-1}dx} = (x^2 - 1)$ Multiplying the I.F. with the given differential equation $y(x^2 - 1) = 2\int\frac{1}{x^2-1}dx$	2 1

	$y(x^2-1) = \log\frac{\lvert x-1\rvert}{\lvert x+1\rvert} + C$	2
35	$I = \int_0^{\frac{3}{2}} \lvert x\cos\pi x\rvert\, dx$ $= \int_0^{\frac{1}{2}} x\cos\pi x\, dx - \int_{\frac{1}{2}}^{\frac{3}{2}} x\cos\pi x\, dx$ …..(1) Consider $\int x\, cos\pi x\, dx$ $= \frac{x\sin\pi x}{\pi} - \int\frac{\sin\pi x}{\pi}dx$ $= \frac{x\sin\pi x}{\pi} + \frac{\cos\ \pi x}{\pi^2}$ Substituting in the definite integral (1), we get $\left[\frac{x\sin\pi x}{\pi} + \frac{\cos\ \pi x}{\pi^2}\right]_0^{\frac{1}{2}} - \left[\frac{x\sin\pi x}{\pi} + \frac{\cos\ \pi x}{\pi^2}\right]_{\frac{1}{2}}^{\frac{3}{2}}$ $= \left(\frac{1}{2\pi} - \frac{1}{\pi^2}\right) - \left(-\frac{3}{2\pi} - \frac{1}{2\pi}\right) = \frac{5}{2\pi} - \frac{1}{\pi^2}$ **OR** For rewriting $\int\frac{(sinx+cosx)}{\sqrt{sinx.cosx}}dx$ For taking substitution $sinx - cosx = t$ and rewriting the integration as $\int\sqrt{2}\frac{dt}{\sqrt{1-t^2}}$ Evaluating and getting answer $\sqrt{2}sin^{-1}(sin\ x - cos\ x) + c$ or $\sqrt{2}\tan^{-1}\frac{tanx-1}{\sqrt{2}tanx} + C$	 1 ½ 1 ½ 1 1 1+1 1+1 1

Q.No.	**EXPECTED ANSWER OR VALUE POINTS**	Marks
36	(i) $h = \frac{2000}{r^2}, C = 100\pi r^2 + 50(2\pi rh) = 100\pi\left(r^2 + \frac{2000}{r}\right)$ (ii) $\frac{dC}{dr} = 100\pi\left(2r - \frac{2000}{r^2}\right), \frac{dC}{dr} = 0, r = 10m$ (iii) $(a)\frac{d^2C}{dr^2} > 0, at\ r = 10m, cost\ is\ minimum$ $h = \frac{2000}{10^2} = 20m$ **OR** $(b)\ C(10) = 100\pi\left(10^2 + \frac{2000}{10}\right) = ₹30{,}000\pi$	1 1 2 2
37	(i) $2^{3x2} = 2^6 = 64$ (ii) $\{(g_1, g_1), (g_2, g_2)\}$ (iii) (A) so the minimum number of elements to be added are (b1, b1), (b2, b2), (b3, b3), (b2, b3)	1 1 2

	(B) so the minimum number of elements to be added are (b1, b1), (b2, b2), (b3, b3), (b2, b3), (b3, b2) **OR** One-one and onto function: F(x) = $\frac{x^2}{4}$ clearly one - one function in $[0,20\sqrt{2}]$ For any arbitrary element in [0, 200] the preimage of y exists in $[0, 20\sqrt{2}]$ Hence f is onto	2
38	(i)P(A1) = $\frac{4}{10}$ P(A2) = $\frac{4}{10}$ P(A3) = $\frac{2}{10}$ let G denote the event of germination P(G/A1) = 45% P(G/A2)= 60% P(G/A3) = 35% P(G) = $\frac{49}{100}$ = 49% (ii) P(A2/G) = $\frac{P(A2).P(G/A2)}{P(G)} = \frac{24}{49}$	2 2