केंद्रीय विद्यालय संगठन, कोलकाता संभाग
KENDRIYA VIDYALAYA SANGATHAN, KOLKATA REGION

PRE-BOARD EXAMINATION – 2025-26

CLASS – XII **SUB. – MATHEMATICS (041)**

MARKING SCHEME

MCQ ANSWERS

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

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

Q.NO	ANSWER	VALUE POINTS
21)	(a)For each value of $tan^{-1}(-1) = -\frac{\pi}{4}$, $sin^{-1}\left(-\frac{1}{2}\right) = -\frac{\pi}{6}$ and $cos^{-1}\left(\frac{-1}{\sqrt{2}}\right) = \frac{3\pi}{4}$ For final correct answer $\pi/3$ **OR** (b) $-1 \le 5x - 4 \le 1$, $3 \le 5x \le 5$, $\frac{3}{5} \le x \le 1$, $x \in \left[\frac{3}{5}, 1\right]$	$3 \times \frac{1}{2}$ 1/2 $4 \times \frac{1}{2}$
22)	$x\sqrt{1+y} = -y\sqrt{1+x} = 0$ Squaring and getting $y = -\frac{x}{1+x}$ Diff w r t x and getting $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$	 1 1
23)	$\because f(x)$ *is* continuous at x= 0 $\therefore LHL = RHL = f(0)$ After solving and finding that there is no value of m for which f(x) is continuous at x=0.	1 1
24)	$using\ \left\|\vec{a}+\vec{b}+\vec{c}\right\|^2 = (\vec{a}+\vec{b}+\vec{c}).(\vec{a}+\vec{b}+\vec{c})$ and using $\vec{a}, \vec{b}, and\ \vec{c}$ as a unit vector For correct answer -3/2	1.5 0.5
25)	(a) $\int e^x\left(\frac{1+\sin x}{1+\cos x}\right)dx = \int e^x\left(\frac{1+2sin\frac{x}{2}cos\frac{x}{2}}{2\,cos^2\frac{x}{2}}\right)dx$ $\int e^x\left(\frac{1}{2}sec^2\frac{x}{2} + \tan\frac{x}{2}\right)dx = e^x\tan\frac{x}{2} + C$ **OR** (b) for correct graph and area = $2\int_0^3 y\,dx$	1 1 1

	Evaluating the correct answer $8\sqrt{3}\ square\ units$	1
26)	$y = e^{acos^{-1}x}$ by differentiating $\frac{dy}{dx} = e^{acos^{-1}x} \times \frac{-a}{\sqrt{1-x^2}} = \frac{-ay}{\sqrt{1-x^2}}$ So $\sqrt{1-x^2}\frac{dy}{dx} = -ay$, Again differentiating and getting the result	1 2
27)	Writing correct relation $x^2 + y^2 = 25\ and\ deriving\ 2x\frac{dx}{dt} + 2y\frac{dy}{dt} = 0$ $using\ \frac{dx}{dt} = 2cm/s$ and evaluating $y = 3m\ when\ x = 4m$ For evaluating correct answer -8/3 cm/s	1 1 1
28)	**(a)** For correct graph of $y = \|x+3\|$ The integral represents the area bounded by curve $y = \|x+3\|$, the $x-\ axis$ and the ordinates at $x = -6\ and\ x = 0$ For evaluating correct integral **OR** (b) For correct graph of $y = x^3$ the x-axis and the ordinates $x = -2$ and $x = -1$ and shading the region For Evaluating correct area in square units	1 1 1 1.5 1.5
29)	(a) d.r. of given lines $-3,\ \frac{2p}{7},\ 2\ and\ -\frac{3p}{7},\ 1,\ -5$ using condition of perpendicularity and finding the value of $p\ as\ \frac{70}{11}$ equation of first line in vector form $\vec{r} = (\hat{\imath} + 2\hat{\jmath} + 3\hat{k}) + \lambda\left(-3\hat{\imath} + \frac{40}{11}\hat{\jmath} + 2\hat{k}\right)$ **OR** (b) Deciding that given lines are parallel Using the formula for distance between parallel lines Calculating $\left\|(\vec{a}_2 - \vec{a}_1) \times \vec{b}\right\|$ and $\left\|\vec{b}\right\|$ and using the formula to get the distance $\frac{\sqrt{293}}{7}$ units	1 1 1 0.5 0.5 2
30)	S = {BB, BG, GB, GG} , Let A = both are girls = {GG}, B = the youngest is a girl = {BG, GG} , and C = at least one is a girl = { BG, GB, GG} so that (i) P(A|B) = $\frac{P(A\cap B)}{P(B)} = \frac{\frac{1}{4}}{\frac{2}{4}} = \frac{1}{2}$ (ii) P(A|C)= $\frac{P(A\cap C)}{P(C)} = \frac{\frac{1}{4}}{\frac{3}{4}} = \frac{1}{3}$	1 1 1
31)	For correct feasible region For corner point, corresponding value of Z and finding solution, $x =$, $y =$, $Z =$	1.5 1.5
32)	Evaluating $\|A\|$ = 9 Evaluating $A^{-1} = \frac{1}{9}\begin{bmatrix} 7 & -3 & 2 \\ 3 & 0 & -3 \\ -1 & 3 & 1 \end{bmatrix}$	1 2

	Writing equations in Matrix form $AX = B$ and Using $X = A^{-1}B = \begin{bmatrix}1\\2\\3\end{bmatrix}$ and calculating the values of $x = 1, y = 2\ and\ z = 3$	2
33)	(a) Let $\frac{x}{(x-1)^2(x+2)} = \frac{A}{x-1} + \frac{B}{(x-1)^2} + \frac{C}{x+2}$. $x = A(x-1)(x+2) + B(x+2) + C(x-1)^2$. On solving, $A = 2/9$, $B = 1/3$, $C = -2/9$. $\int \frac{x}{(x-1)^2(x+2)} dx = \int \frac{2/9}{x-1} + \frac{1/3}{(x-1)^2} + \frac{-2/9}{x+2}$ dx $= 2/9 \log\lvert x-1\rvert - \frac{1}{3(x-1)} - 2/9 \log\lvert x+2\rvert + C$ $= 2/9 \log\left\lvert\frac{x-1}{x+2}\right\rvert - \frac{1}{3(x-1)} + C$. **OR (b)** $\int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{16+9\sin 2x} dx$ $= \int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{16 + 9[1-(\sin x - \cos x)^2]} dx$ $= \int_0^{\frac{\pi}{4}} \frac{\sin x + \cos x}{25 - 9(\sin x - \cos x)^2} dx$ Let, $\sin x - \cos x = z$ $\therefore (\cos x + \sin x) dx = dz$ $= \int_{-1}^{0} \frac{dz}{25 - 9z^2}$ $= -\frac{1}{2.5.3}\left[\log\left\lvert\frac{3z-5}{3z+5}\right\rvert\right]_{-1}^{0}$ $= -\frac{1}{30}[\log 1 - \log 4] = \frac{1}{30}\log 4$ Table: x: 0, $\frac{\pi}{4}$; z: -1, 0	1 2 2 2 2 1
34)	(a) $(1 + x^2) dy + 2xy\, dx = \cot x\, dx$ $\frac{dy}{dx} + \frac{2xy}{(1+x^2)} = \frac{\cot x}{1+x^2}$ It is a linear differential equation , Writing value of P and Q applying formula I.F. = $1 + x^2$ Solution is given by $y \times I.F. = \int Q \times I.F\, dx$ After solving $y(1 + x^2) = log\lvert sinx\rvert + C$	1 1 1 1 1

x	0	$\frac{\pi}{4}$
z	-1	0

	OR (b) $xdy = \left(y + \sqrt{x^2 + y^2}\right)dx$ $\Rightarrow \frac{dy}{dx} = \frac{y}{x} + \sqrt{1 + \frac{y^2}{x^2}}$ which is a homogenous differential equation Putting y = vx $\Rightarrow \frac{dy}{dx} = v + x\frac{dv}{dx}$ $v + x\frac{dv}{dx} = v + \sqrt{1 + v^2}$ $\Rightarrow \int \frac{dv}{\sqrt{1+v^2}} = \int \frac{dx}{x}$ $\Rightarrow \log\left(v + \sqrt{1 + v^2}\right) = logx + logc$ $\Rightarrow v + \sqrt{1 + v^2} = cx$ $\Rightarrow \frac{y}{x} + \frac{\sqrt{y^2 + x^2}}{x} = cx$	1 2 2
35)	(a) Rewriting the vector equation of the line in standard form Writing the values of $\vec{a}_1$ $\vec{a}_2$, $\vec{b}_1$ *and* $\vec{b}_2$ Using the formula for shortest distance and finding the value of shortest distance	1 1 3
36)	The relation can be defined as $xRy\ \ iff\ |x_T - y_T| \leq 6, wher\ x_T = time\ at\ x's\ \ place$ (i) As $|x_T - x_T| = 0$ so relation is reflexive (ii) If $(x, y) \in R \Rightarrow |x_T - y_T| \leq 6 \Rightarrow |y_T - x_T| \leq 6 \Rightarrow (y, x) \in R$ symmetric (iii) (a) Let $(x, y) \in R,\ (y, z) \in R \Rightarrow |x_T - y_T| \leq 6,\ |y_T - z_T| \leq 6 \nRightarrow |x_T - z_T| \leq 6$ so this relation is not transitive. Student will give any one example (b) This relation is not a function as one element of domain have more than one image in codomain.	1 1 2 2
37)	(i) $\frac{\pi x}{2} + x + 2y = 10$ (ii) $A = 5x - \frac{x^2}{2} - \frac{\pi x^2}{8}$ (iii) (a) Equating $\frac{dA}{dx} = 0\ and\ finding\ x\ as\ \frac{20}{\pi+4} m\ for\ maximum\ value\ of\ x$ **OR** (iii) (b) finding maximum value of breadth as $y = \frac{10}{\pi+4}\ m$	1 1 2 2
38)	Let E_1 , E_2 and E_3 are the events that the farmer belongs to Mohalla A, B and C respectively and E is the event that the farmer believes in the new technology. Then P(E_1) =P(E_2) = P(E_3) = 1/3 P(A|E_1) = $\frac{60}{100}$, P(A|E_2) = $\frac{70}{100}$ P(A|E_3) = $\frac{80}{100}$ (i) Probability that a farmer believes in new technology of agriculture = P(A) $=\text{P}(E_1)\text{P}(\text{A}\|E_1) + P(E_2)P(A\|E_2) + \text{P}(E_3)\text{P}(\text{A}\|E_3) = 7/10$ (ii) By Baye's Theorem , Reqired Probability = P($E_2\|A$) $= \frac{P(E_2)P(A\|E_2)}{\text{P}(E_1)\text{P}(\text{A}\|E_1)+P(E_2)P(A\|E_2)+\text{P}(E_3)\text{P}(\text{A}\|E_3)} = 1/3$	1 1.5 1.5