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PRE BOARD EXAMINATION-2024-25

CLASS: XII

SUBJECT: MATHEMATICS (041)

MARKING SCHEME (MS12MAT02PB24)

Q. No.	Question	Marks
	SECTION – A	
1	(d) 512	1
2	(c) $a_{ij} = a_{ji}$ for all i,j	1
3	(d) none of these	1
4	(b) ± 3	1
5	(d) $(A + B)^{-1} = B^{-1} + A^{-1}$	1
6	(d) 1.5	1
7	(a) $\frac{x}{\sqrt{1+x^2}}$	1
8	(b) 12π	1
9	(d) None of these	1
10	(c) $\tan x - \cot x + c$	1
11	(d) 0	1
12	(d) not defined	1
13	(c) $x = vy$	1
14	(d) $a = \frac{1}{\lvert\lambda\rvert}$	1
15	(a) (2, 0, 0)	1
16	(b) (0,8)	1
17	(a) The half plane that contains the positive X-axis	1
18	(b) P(A/B) = 1	1
19	(c) A is true but R is false.	1
20	(a) Both A and R are true and R is the correct explanation of A.	1
	SECTION – B	
21	Given a correct example ∴ R is not transitive.	1 1
22	Taking logarithm on both sides Differentiating both sides with respect to x So $\frac{dy}{dx} = \frac{y(y-x\log y)}{x(x-y\,\text{lo}\quad)}$ OR $f(x)\ is\ continous\ at\ x = \pi$ $LHL = RHL = f(\pi)$ $k = \frac{-2}{\pi}$	1 1 1 1

23	$I = \int \frac{(x+1)(x+\log x)^2}{x} dx$ $Let\ x + \log x = t$ $(1+\frac{1}{x})dx = dt$ $I = \int t^2 dt$ $= \frac{1}{3}(x+\log x)^3 + C$	½ 1 ½
24	For correct diagram $y = \sqrt{4^2 - x^2}$, required area $=4\pi$ square units. **OR** For correct diagram $y = \frac{4}{5}\sqrt{5^2 - x^2}$ required area $=5\pi$ square units.	½ ½ 1 ½ ½ 1
25	a,b,c are unit vectors $\therefore \lvert\vec{a}\rvert=\lvert\vec{b}\rvert=\lvert\vec{c}\rvert=1$ $\vec{a}+\vec{b}+\vec{c}=\vec{0}$ (given) $\therefore (\vec{a}+\vec{b}+\vec{c})^2 = 0$ $\therefore \lvert\vec{a}\rvert^2+\lvert\vec{b}\rvert^2+\lvert\vec{c}\rvert^2 + 2(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}) = 0$ $1+1+1+2(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}) = 0$ $\therefore \vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a} = -\frac{3}{2}$	1 1
	SECTION C	
26	$y = 3\cos(\log x) + 4\sin(\log x)$ $\frac{dy}{dx} = -3\sin(\log x)\frac{1}{x} + 4\cos(\log x)\frac{1}{x}$ $x\frac{dy}{dx} = -3\sin(\log x) + 4\cos(\log x)$ $x\frac{d^2y}{dx^2} + \frac{dy}{dx} = -3\cos(\log x)\frac{1}{x} - 4\sin(\log x)\frac{1}{x}$ $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} = -\{3\cos(\log x) + 4\sin(\log x)\}$ $x^2y_2 + xy_1 + y = 0$	1 1 1
27	$\int \sqrt{\left(\frac{\sqrt{13}}{2}\right)^2 - \left(x-\frac{3}{2}\right)^2}\, dx$ WKT $\int \sqrt{(a)^2-(x)^2}dx = \frac{x}{2}\sqrt{(a)^2-(x)^2} + \frac{a^2}{2}\sin^{-1}\left(\frac{x}{a}\right) + c$ $=\frac{2x-3}{4}\sqrt{1+3x-x^2} + \frac{13}{8}\sin^{-1}\frac{2x-3}{\sqrt{13}} + c$ **OR**	1 ½ 1½ 2

	$\int_0^1 (xe^x + \sin\frac{\pi x}{4})\, dx = [xe^x - e^x]_0^1 + \left[-\frac{4}{\pi}\cos(\frac{\pi x}{4})\right]_0^1$ $= 1 + \frac{4}{\pi}\frac{(\sqrt{2}-1)}{\sqrt{2}}$	1
28	Diagram $2\int_0^a y dx = 2\int_a^4 y dx$ $\Rightarrow \int_0^a \sqrt{x} dx = \int_a^4 \sqrt{x} dx$ $\Rightarrow 2a^{3/2} = 8$ $\Rightarrow a = 4^{2/3}$	1 1/2 1/2 1
29	It is a homogenous differential equation, Put y = vx Then dv = dx/x $\frac{y}{x} = \log cx$ $x = ke^{\frac{y}{x}}$ **OR** $\frac{dy}{dx} + 2\frac{y}{x} = x$ I.F. = x^2 $yx^2 = \frac{x^4}{4} + c$	1 1 1 ½ 1 1.5
30	correct graph correct corner points Hence, Z is maximum at x = $\frac{7}{2}$, y = $\frac{3}{4}$ and maximum value = 19	1 1 1
31	P(E) = P (black ball in first draw) =10/15 Also given that the first ball drawn is black, i.e., event E has occurred, now there are 9 black balls and five white balls left in the urn. Therefore, the probability that the second ball drawn is black, given that the ball in the first draw is black, is nothing but the conditional probability of F given that E has occurred. i.e. P(F|E) = 9/14 By multiplication rule of probability, we have $P(E \cap F) = P(E)\, P(F \mid E)$ $= \frac{10}{15} \times \frac{9}{14} = \frac{3}{7}$ **OR** The random variable X has a probability distribution P(X) of the following form, where *k* is some number :	1/2 1/2 1 1 1

X	0	1	2	OTHERWISE	
P(X)	K	2K	3K	0	

	(a) As Sum of all probabilities should be $\Rightarrow k+2k+3k=1 \quad \Rightarrow k=1/6$ (b) $P(x<2)=p(x=0)+p(x=1)=k+2k=3(\frac{1}{6})=\frac{1}{2}$ (c) $P(x\geq 2)=3k+0=3(\frac{1}{6})+0=\frac{1}{2}$	1 1 1
	SECTION D	
32	ONE -ONE Correct example f is not one-one. Onto :- Also, f is not onto for if so then for $1 \in R\ \exists\ x \in R$ such that $f(x)=1$ which gives $\frac{x}{x^2+1}=1$. But there is no such x in the domain **R**, since the equation $x^2-x+1=0$ does not give any real value of x. **OR** Let R be defined on N×N as $(a,b)R(c,d) \Leftrightarrow ad(b+c)=bc(a+d)$. ....(1) **Reflexivity:** R is reflexive. **Symmmetry :** R is symmetric **Transitivity :** R is transitive ∴R is Equivalence Relation.	2.5 2.5 1.5 1.5 2
33	$$\begin{bmatrix}-4 & 4 & 4\\-7 & 1 & 3\\5 & -3 & -1\end{bmatrix}\begin{bmatrix}1 & -1 & 1\\1 & -2 & -2\\2 & 1 & 3\end{bmatrix}=\begin{bmatrix}8 & 0 & 0\\0 & 8 & 0\\0 & 0 & 8\end{bmatrix}$$ $$B^{-1}=\frac{1}{8}\begin{bmatrix}-4 & 4 & 4\\-7 & 1 & 3\\5 & -3 & -1\end{bmatrix}$$ Now Matrix from of equations $$\begin{bmatrix}1 & -1 & 1\\1 & -2 & -2\\2 & 1 & 3\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}4\\9\\1\end{bmatrix}$$ $X=B^{-1}C$ Hence $x=3$, $y=-2$ and $z=-1$.	1 1 1 2
34	$$\int \frac{1}{\cos(x-a)\cos(x-b)}dx$$ Multiplying and dividing with sin(a-b) $$\frac{1}{\sin(a-b)}\int \frac{\sin(a-b)}{\cos(x-a)\cos(x-b)}dx$$ $$=\frac{1}{\sin(a-b)}\int \frac{\sin[x-b-x+a]}{\cos(x-a)\cos(x-b)}dx$$ $$=\frac{1}{\sin(a-b)}\int \frac{\sin(x-b)\cos(x-a)-\cos(x-b)\sin(x-a)}{\cos(x-a)\cos(x-b)}dx$$ $$=\frac{1}{\sin(a-b)}\int[\tan(x-b)-\tan(x-a)]dx$$	1 1 1 2

Q	Solution	Marks
	$= \frac{1}{\sin(a-b)} \log \frac{\cos(x-a)}{\cos(x-b)} + C$	
	OR	
	Let $I = \int_0^{\frac{\pi}{2}} \log \sin x \; dx$ ---(i)	
	Then, using P-4	1
	$I = \int_0^{\frac{\pi}{2}} \log \sin(\frac{\pi}{2} - x) \; dx = \int_0^{\frac{\pi}{2}} \log \cos x \; dx$ ---(ii)	2
	$2I = \int_0^{\frac{\pi}{2}} \log \sin x \, dx - \frac{\pi}{2} \log 2$	2
	$2I = I - \frac{\pi}{2} \log 2$	
	$I = -\frac{\pi}{2} \log 2$	
35	For finding	
	$x_1=-1, y_1=-1, z_1=-1$	1.5
	$a_1=7, b_1=-6, c_1=1$	
	$x_2=3, y_2=5, z_2=7$	
	$a_2=1, b_2=-2, c_2=1$	
	Then, using the distance formula	2
	the distance between the given lines is $2\sqrt{29}$ units.	0.5
	OR	
	Find d.r. of required line where a=-4, b= 4 & c=-1	1
	Equation of required line in vector equation & cartesian equations $= \frac{x-1}{-4} = \frac{y-1}{4} = \frac{z-1}{-1}$	1
	& $\vec{r} = (\hat{i} + \hat{j} + \hat{k}) + \lambda(-4\hat{i} + 4\hat{j} - \hat{k})$	1
	And find angle $\theta = \cos^{-1} \frac{24}{\sqrt{609}}$	2
	SECTION E	
36	(i) $(300 - 3x)$ & $(80 + x)$	1
	(ii) $-3x^2 + 60x + 24000$	1
	(iii) 10	2
	Or	
	11th July	
37	$P(E_1) = 3/10$ $P(E_2) = 1/5$ $P(E_3) = 1/10$ $P(E_4) = 2/5$	
	Let A be the event of coming late	
	$P(A/E_1) = 1/4$ $P(A/E_2) = 1/3$ $P(A/E_3) = 1/12$ $P(A/E_4) = 0$	
	(i) Total probability $P(A) = \sum_{i=1}^{4} P(E_i).P(A/E_i)$	1
	$= \frac{3}{10} \times \frac{1}{4} + \frac{1}{5} \times \frac{1}{3} + \frac{1}{10} \times \frac{1}{12} + \frac{2}{5} \times 0$	
	$= \frac{3}{20}$	1
	(ii) Using Baye's Theorem	

	$P(E_1/A)=\frac{P(E_1).P(A/E_1)}{\sum_{i=1}^{4}P(E_i).P(A/E_i)}$	1
	$=\frac{\frac{3}{10}\times\frac{1}{4}}{\frac{3}{10}\times\frac{1}{4}+\frac{1}{5}\times\frac{1}{3}+\frac{1}{10}\times\frac{1}{12}+\frac{2}{5}\times 0}$	1
	$=\frac{1}{2}$	
38	(i) the Direction ratios of $OA = 1,0,0$ (ii) the Equation of diagonal $OB' = \frac{x}{1}=\frac{y}{2}=\frac{z}{3}$ (iii) find the Equation of Line $O'B' = \frac{x}{1}=\frac{y}{2}=\frac{z-3}{0}$ OR the cartesian equation of line along $\overrightarrow{A'C'} = \frac{x-1}{1}=\frac{y}{-2}=\frac{z-3}{0}$	1 1 2