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SAMPLE QUESTION PAPER

CLASS XII

TIME: 3hrs MATHEMATICS M.M 100

GENERAL INSTRUCTIONS:

1. **All questions are compulsory**
2. **The question paper consists of 29 questions divided into three sectionsA, B and C.**

   Section A comprises of 10 questions of 1 mark each.Section B comprises of 12 questions of 4 marks each and Section C comprises of 7 questions of 6 marks each.

3. **All questions in Section A are to be wriitten in one word, one sentence or as per the exact requirement of questions.**
4. **There is no overall choice.However, internal choice has been provided in 4 questions of 4marks and 2 questions of 6marks each.You have to attempt only one of the alternatives in all such questions.**
5. **Use of calculator is not permitted.You may ask for logarithmic tables, if required.**

SECTION- A

1. **If A=** $\begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$ **, find the determinant** A^2 **-2A.**
2. **If A=** $\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, **B=**$\begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix}$ **,find** $(BA)^T$
3. **If f: R→** R **is a bijection given b y f(x) =** x^3**+3, find** f^{-1}**(x).**
4. **Using principal value,evaluate:** $Sin^{-1}\left(Sin\frac{3\pi}{5}\right)$
5. **Find the equation of the tangent to the curve y =**$-5x^2 + 6x + 7$ **at the point** $\left(\frac{1}{2}, \frac{35}{4}\right)$
6. **Find**$\left|\vec{a} - \vec{b}\right|$ **, if two vectors** $\vec{a}$ **and** $\vec{b}$ **are such that** $|\vec{a}|$**=2 and** $\left|\vec{b}\right|$**=3 and**$\vec{a}.\vec{b}$ **=4.**
7. **Evaluate:** $\int_0^{\pi} \frac{dx}{1+Sinx}$
8. **Evaluate:** $\int \frac{3x}{1+2x^4} dx$
9. **Let** $\begin{bmatrix} x+3 & 2x \\ 6 & y \end{bmatrix} = \begin{bmatrix} 7 & 8 \\ 6 & 3 \end{bmatrix}$ **, then find the value of x and y.**
10. **Find projection of** $\vec{a} = 2\hat{\imath} + 3\hat{\jmath} - \hat{k}$ **on** $\vec{b} = \hat{\imath} - 3\hat{\jmath} + 2\hat{k}$

SECTION B

11. Let A=QxQ.Let '*' be a binary operation on A defined by : (a,b)*(c,d) = (ac,ad+b).Find i) Identity element of (A,*) & ii) the invertible element of (A,*).

12. Solve: $tan^{-1}(x+1) + tan^{-1}(x-1) = tan^{-1}\frac{8}{31}$, x>0

OR

Find the value of $2tan^{-1}(\frac{1}{5}) + sec^{-1}(\frac{5\sqrt{2}}{7}) + 2tan^{-1}(\frac{1}{8})$

13. Using properties , show that $\begin{vmatrix} 1 & a & a^2-bc \\ 1 & b & b^2-ca \\ 1 & c & c^2-ab \end{vmatrix}=0$

14. Showthat $f(x)=\begin{cases} \frac{sin3x}{tan2x}, if\ x>0 \\ \frac{3}{2}, if\ x=0 \\ 3\frac{(e^x-1)}{e^{2x}-1},\ if\ x<0 \end{cases}$ is continuous at x=0

15. If $y=\left[x+\sqrt{x^2+a^2}\right]^n$,then prove that $\frac{dy}{dx} = \frac{ny}{\sqrt{x^2+a^2}}$

OR

If y=ACosmx+BSin mx, show that $\frac{d^2y}{dx^2} + m^2y = 0$

16. Showthat $y = log(1+x) - \frac{2x}{2+x}$ is an increasing function of x for all values of x>-1

17. Evaluate: $\int_0^{\frac{\pi}{2}} \frac{dx}{2Cosx+4Sinx}$ OR Evaluate: $\int \frac{3x-2}{(x+3)(x^2+1)}dx$

18. Solve the differential equation : $\frac{dy}{dx} = 3yCotx + Sin2x$, given that y=2,when $x = \frac{\pi}{2}$.

OR

Solve the differential equation:$(1+y^2)(1+logx)dx + xdy = 0, given\ that\ y = 1, when\ x = 1$

19. Solve the differential equation: $\left(1+e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1-\frac{x}{y}\right)dy = 0$

20. The scalar product of the vector $\hat{i}+\hat{j}+\hat{k}$ with the unit vector along the sum of vectors $2\hat{i}+4\hat{j}-5\hat{k}$ and $\lambda\hat{i}+2\hat{j}+3\hat{k}$ is equal to one.Find the value of λ

21. Find the vector equation of the line passing through (1,2,3) and parallel to the planes $\vec{r}.(\hat{i}-\hat{j}+2\hat{k}) = 5\ and\ \vec{r}.(3\hat{i}+\hat{j}+\hat{k}) = 6$

22. Three students A, B and C are given a question to solve.Their respective probability to solve the question are $\frac{1}{2},\frac{1}{3}$ & $\frac{1}{4}$. What is the probability that only one of them solves it correctly?

SECTION C

23. If $A = \begin{bmatrix} 2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2 \end{bmatrix}$, find A^{-1}. Using A^{-1} solve the following system of linear equations 2x-3y+5z=11, 3x+2y-4z=5 and x+y-2z= -3

24. Show that the height of the cylinder of maximum volume that can be inscribed in a shpere of radius R is $\frac{2R}{\sqrt{3}}$.Also find the maximum volume.

OR

Show that the right circular cone of least curved surface area and givenvolume has an altitude equal to $\sqrt{2}$ times the radius of the base.

25. Evaluate: $\int_0^a Sin^{-1}\left(\sqrt{\frac{x}{a+x}}\right)$ dx OR Evaluate: $\int_0^\pi \frac{xSinx}{1+Cos^2x}$dx

26. Find the area of the region: $\{(x, y): y^2 \leq 4x, 4x^2 + 4y^2 \leq 9\}$

27. Find the equation of the plane passing through the point (-1,2,1) and perpendicular to the line joining the points (-3,1,2) and (2,3,4). Find also the perpendicular distance of the origin from the plane.

28. If an old man rides his motor cycle at 25 km/hr, he has to speend Rs. 2 per km on petrol.If he rides at a faster speed of 40 km /hr, the petrol cost increases to Rs.5 per km. He has Rs 100 to spend on petrol and wishes to find maximum distance he can travel within one hour.Express this as a linear programming problem and then solve it.

29. There are 3 bags each containing 5 white balls and 3 black balls.Also there are 2 bags, each containing 2 white balls and 4 black balls.A white ball is drawn at random.Find the probability that this white ball is from a bag of the first group.

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MARKING SCHEME

SAMPLE PAPER

MATHEMATICS-CLASS XII

	SECTION A		
Q.No.	Value Points	Marks	Total
1	36		1
2	$\begin{bmatrix} 6 & -1 \\ -7 & 3 \end{bmatrix}$		1
3	$(\sqrt[3]{x-3})$		1
4	$\frac{2\pi}{5}$		1
5	**4x-4y+33=0**		1
6	$\sqrt{5}$		1
7	2		1
8	$\frac{3}{2\sqrt{2}} tan^{-1}(\sqrt{2}\ x^2) + c$		1
9	X=4 and y=3		1
10	$\frac{-9}{\sqrt{14}}$		1
	SECTION B		
11	Property of Id element Id element (1,0) Prtoperty of Inverse Inverse doesn't	1 1 1 1	4
12	Application of correct formula Correct equation Solving $4x^2 - 31x - 8 = 0$ and x=8 OR Application of formula Second application Combining to get $tan^{-1}\frac{25}{25} = \frac{\pi}{4}$	1 1 2 1 1 2	4
13	Use of three properties and Conclusion	2 2	4
14	Calculation of LHL Calculation of RHL Conclusion LHL=RHL=f(0)=3/2	11/2 11/2 1	4

15	Finding of dy/dx and rearranging OR Writing correct derivatives Rearrangement and proof	2+2 1+1 2	4
16	Finding first derivative Simplification Expressing as perfect squares and conclusion	1 1 2	4
17	Expressing the denominator in cos or sin. Applying the correct integral Simplification.or any other alternate methods OR Using partial fraction and finding three constants Evaluating three integrals and simplification,An: $\frac{11}{10}\log\left(\frac{\sqrt{x^2+1}}{x+3}\right)-\frac{3}{11}tan^{-1}x+c$	1 1 2 2 2	4
18	Identification and I.F-linear and I.F.is $Cosec^3x$ Solving :y$Cosec^3x$ =$\int Sin2x\, Cosec^3x dx+c$ Writing particular solution:$y=sin^2x(-2+4sinx)$ OR Separating the variables Inegrating by substitution Solving and writing Particular solution:$\frac{(1+logx)^2}{2}+tan^{-1}y \quad =\frac{\pi}{4} \ +\frac{1}{2}$	11/2 2 1/2 1 1 2	4
19	Identification and substitution Separating variables Integrating and replacing v by x/y Solu. Is $x+ye^{\frac{y}{x}} \ =c$	1 1 2	4
20	Concept of unit vector Sum of 2î **+4ĵ-5$\hat{k}$ and λ î +2ĵ+$\widehat{3k}$** **Modulus of the above sum** **Dot product and value of λ=1**	1/2 1 ½ 2	4
21	Equation of line is $\frac{x-1}{a}=\frac{y-2}{b}=\frac{z-3}{c}$ Concept of normal and line(perpependicular) Solving of equations a-b+2c=0 and 3a+b+c=0 as a=-3,b=5 and c=4 Writing the final equatrion	1 1 11/2 1/2	4
22	Probabilities for not soliving Required probability=P($\overline{A}\ \overline{B}$C)+P($\overline{A}$ B$\overline{C}$)+P(A$\overline{B}\ \overline{C}$) $=\frac{11}{24}$	11/2 21/2	4
	SECTION C		
23	detA=-1$\neq 0, A^{-1}$ exists	1	

	adjA= $\begin{bmatrix} 0 & 1 & 2 \\ -2 & -9 & -23 \\ 1 & 5 & 13 \end{bmatrix}$ &B= $\begin{bmatrix} 11 \\ 5 \\ -3 \end{bmatrix}$ X= $\frac{1}{\lvert A \rvert}$ $(adjA)\ B$ gives x=1,y=2and z=3	3 2	6
24	Writing the correct relation in one variable Step wise application of differentiation Obtaining the correct relationand max. volume= $\frac{8}{9}\pi R^3(3-\sqrt{3})$ OR Finding the correct relation in one variable Step wise application of differentiation Obtaining the correct relation	2 2 2 2 2 2	6
25	Giving substitution as $x = atan^2\theta$ and simplication $Relpacing\ dx\ by\ 2asec^2\theta\ tan\theta and\ applying\ integration\ by\ parts$ Application of limits and simplification,An: $\frac{a}{2}(\pi - 2)$ OR Application of propertyand 2I Evaluating integral by substitution Appliying limits and simplification.An : $\frac{\pi^2}{4}$	2 2 2 1+1 2 2	6
26	Identification of the given curves and rough sketch Solving the equations and finding limit of integrals $4x^2$+16x-9=0 gives x=1/2and Area= $2\int_0^{\frac{1}{2}} 2\sqrt{x}\,dx + 2\int_{\frac{1}{2}}^{\frac{3}{2}} \sqrt{\frac{9}{4} - x^2}dx = \frac{9\pi}{8} + \frac{\sqrt{2}}{6} - \frac{9}{4}sin^{-1}\left(\frac{1}{3}\right)$	1 2 3	6
27	Equation of plane passing through (-1,2,1) is A(x+1)+B(y-2)+C(z-1)=0 Equation of a line joining (-3,1,2) and (2,3,4) is $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z-2}{2}$ Since the plane is perpendicular to the line ,line and normal are parallel an A=5,B=2 and C=2 Equation of plane is 5x+2y+2z-1=0 Distance from origin to the plane is $\frac{1}{\sqrt{13}}$units	1 2 1 1 1	6
28	Let the old man travel xkm at 25km/hr and y km at40km/hr Objective function is z=x+y Constraints : x $\geq 0, y \geq 0$ 2x+5y ≤ 100 and $\frac{x}{25} + \frac{y}{40} \leq 1\ ie, 8x + 5y \leq 200$ Graphing two lines with scale and shading of common region Locating the corner points as O(0,0),(25,0), $\left(\frac{50}{3}, \frac{40}{3}\right)$ and (0,20)and calculation of z(max)=30 at $\left(\frac{50}{3}, \frac{40}{3}\right)$	½ ½ 2 2 1	6
29	Let E1be the event of selecting a bag from the first group And E2 E1be the event of selecting a bag from the second group A be the event of ball drawn is white	11/2	

	Then, P(E1)=3/5,P(E2)=2/5 and P(A/E1)=5/8, P(A/E2)=5/8 Therefore the required probability ,P(E1/A)=$\frac{P(E1)P(\frac{A}{E1})}{P(E1)P\left(\frac{A}{E1}\right)+P(E2)P(\left(\frac{A}{E2)}\right)}$ $=\frac{\frac{3}{5}x\frac{5}{8}}{\frac{3}{5}x\frac{5}{8}+\frac{2}{5}x\frac{1}{3}}=\frac{45}{61}$	2 1 11/2	6