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HALF- YEARLY TEST PAPER

CLASS – XII **TIME – 3 HRS.**

SUBJECT - MATHEMATICS **FULL MARKS – 80**

General Instructions:

1. All the questions are compulsory.

2. The questions paper consists of 36 questions divided into 4 sections A, B, C and D.

3. Section A comprises of 20 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 6 questions of 4 marks each. Section D comprises of 4 questions of 6 marks each.

4. There is no overall choice. However, an internal choice has been provided in two questions of 1 mark each, two questions of 2 marks each, four questions of 3 marks each and three questions of 4 marks each. You have to attempt only one of the alternatives in all such questions.

SECTION –A

1. Differentiation of logx.sinx

(a) sinx.1/x
(b) cosx.sinx + logx
(c) sinx.1/x + logx.cosx
(d) cosx.(-1/x) + 1/logx

2. y = sinx + cosx - 5a what is dy/dx

(a) cosx - sinx
(b) cosx + sinx -5
(c) sinx – secx
(d) sinx + cosx + 5

3. What is the value of factorial Zero (0!)

(a) 10
(b) 0
(c) 1
(d) -1

4. The function f(x) = x/2 + 2/x has a local minimum at

(a) x = 2

(b) x = −2
(c) x = 0
(d) x = 1

5. A tangent drawn to the curve y = f(x) at P(x, y) cuts the x-axis and y-axis at A and B respectively such that BP : AP = 3 : 1, given that f(1) = 1, then

(a) equation of curve is x dy/dx - 3y = 0
(b) normal at (1, 1) is x + 3y = 4
(c) curve passes through (2, 1/8)
(d) equation of curve is x dy/dx + 3y = 0

6. The normal to the curve x = a(1 + cosq), y = asinq at 'q' always passes through the fixed point

(a) (a, 0)
(b) (0, a)
(c) (0, 0)
(d) (a, a)

7. Evaluate $Sin\left\{\frac{1}{2}\cos^{-1}\left(\frac{4}{5}\right)\right\}$

8. If $2\begin{bmatrix}3 & 4\\5 & X\end{bmatrix}+\begin{bmatrix}1 & y\\0 & 1\end{bmatrix}=\begin{bmatrix}7 & 0\\10 & 5\end{bmatrix}$, then find (X – Y).

9. Solve for X ; $[X \quad 1]\begin{bmatrix}1 & 0\\-2 & 0\end{bmatrix}=0$.

10. Find the value of k if the matrix $\begin{bmatrix}k & 1\\2 & -4\end{bmatrix}$ is singular .

11. Find the values of x, y and z if $\begin{pmatrix}x+y+z\\x+z\\y+z\end{pmatrix}=\begin{pmatrix}9\\5\\7\end{pmatrix}$.

12. Given that A, B are two symmetric matrices such that AB =BA .Is AB symmetric?

13. Evaluate: sin $[2\cos^{-1}(-3/5)]$.

14. What is the principal value of $\tan^{-1}[\tan 2\pi/3]$?

15. Find the derivative of tan $f(x)= e^{\tan x}$ with respect to x at x = 0.

16. If A is a 3 × 3 matrix, |A| ≠ 0 and |3A| = k |A|, then write the value of *k*.

17. Write the direction-cosines of the line joining the points (1, 0, 0) and (0, 1, 1).

18. Write the projection of the vector ***i*** − ***j*** on the vector ***i*** + ***j***.

19. What are the direction cosines of a line, which makes equal angles with the co-ordinates axes?

20. If ***a* . *a*** = 0 and ***a* . *b*** = 0, then please what can be concluded about the vector ***b***?

SECTION –B

21 . IF A = $\begin{bmatrix} 2 & 3 \\ 1 & 0 \end{bmatrix}$ = P + Q where P is symmetric and Q is skew-symmeteric matrix, then find the matrix P and Q.

22. Evaluate $\begin{vmatrix} Sin30^0 & Cos30^0 \\ -\sin 60^0 & Cos60^0 \end{vmatrix}$

23. Write in the simplest form : $\tan^{-1}\left(\frac{1}{\sqrt{x^2-1}}\right)$.

24. Show that x = 2 is a root of the equation $\begin{vmatrix} x & -6 & -1 \\ 2 & -3x & x-3 \\ -3 & 2x & x+2 \end{vmatrix} = 0$ and solve it completely.

25. Find the interval in which the function f given by f(x) = $2x^2$ – 3x is

(a) strictly increasing (b)) strictly decreasing

26. Find the approximate value of f(2.01), where f(x) = $4x^2$ + 5x + 2.

SECTION –C

27. Write in the simplest form $\tan\left[\frac{1}{2}\sin^{-1}\left(\frac{2x}{1+x^2}\right)+\frac{1}{2}\cos^{-1}\left(\frac{1-y^2}{1+y^2}\right)\right]$

28. Using matrices solve the system $2x-3y+5z=11;\ 3x+2y-4z=-5;\ x+y-2z=-3$.

29. Find a point on the curve $y=x^2-4x+5$ where the tangent to the curve is parallel to the x- axis .

30. Differentiate: $y=\sqrt{\frac{(x-3)(x^2+4)}{3x^2+4x+5}}$ with respect to x .

31. Using properties of determinants prove that

$$\begin{vmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{vmatrix} = (1+a^2+b^2)^3$$

32. **If** $\sqrt{1-x^2}+\sqrt{1-y^2}=a(x-y)$ **prove that** $\frac{dy}{dx}=\sqrt{\frac{1-y^2}{1-x^2}}$.

SECTION –D

33. find the value of X such that [1 x 1] $\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ X \end{bmatrix}$ = 0.

34. **Discuss the continuity of the function at x = 0:** $f(x)=\begin{cases} \frac{1-Cos2x}{x^2} & x \neq 0 \\ 5 & x=0 \end{cases}$

35. An open box with a square base is to be made out of a given quantity of cardboard of area c^2 .Show that the maximum volume of the box is $\frac{c^3}{6\sqrt{3}}$.

36. Prove that the curves x = y^2 and xy = k cut at right angle if 8 k^2 =1 .