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DELHI INTERNATIONAL SCHOOL, DWARKA

HALF YEARLY EXAMINATION (2017-18)

SUBJECT- MATHS SET-I

CLASS – XII

General Instructions:

i. *All questions are compulsory.*

ii. *The questions paper consists of 29 questions divided into three sections A, B and C. Section A comprises of 4 questions of one mark each, Section B comprises of 8 questions of four marks each, and Section C comprises of 11 questions of six marks each and section D Comprises of 6 question of 6 marks each.*

iii. *All questions of Section are to be answered in one word, one sentence or as per the exact requirement of the question.*

iv. *Use of calculator is not permitted. You may ask for logarithmic tables, if required.*

M .Marks : 100

DURATION : 3 HOURS

SECTION- A

Q1. What is the principal value of $\cos^{-1}\cos(\frac{2\pi}{3}) + \sin^{-1}\sin(\frac{2\pi}{3})$.

Q2. Write the value of $\frac{d}{dx}(\text{cosec}^{-1}x)$.

Q3. Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let f = {(1, 4), (2,5), (3,6)} be a function from A to B . State whether f is one – one or not.

Q4. Evaluate: $\begin{vmatrix} cos15^\circ & sin15^\circ \\ \sin 75^\circ & \cos 75^\circ \end{vmatrix}$

SECTION- B

Q5. Evaluate: $\int sin^3x\, dx$.

Q6 Find $\int \cos^{-1}(\sin x)\, dx$.

Q7. Find 'x' if $\begin{bmatrix} 5 & 3x \\ 2y & z \end{bmatrix} = \begin{bmatrix} 5 & 4 \\ 12 & 6 \end{bmatrix}^T$.

Q8. If A is a square matrix of order 3×3 such that $|\text{adj.}(A)| = 256$, find $|A|$.

Q9. If $\cot^{-1}(-1/5) = x$, find sin x.

Q10. Find : $\int(\frac{1}{sinx.cosx})^2 dx$

Q11. If x = 2cos θ - Cos2θ, and y = 2sinθ – sin2θ, find d^2y/dx^2.

Q12. Show that $\sin^{-1}(3/5) - \sin^{-1}(8/17) = \cos^{-1}(84/85)$

SECTION-C.

Q13. Find x: $[x \quad -5 \quad -1]\begin{pmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{pmatrix}\begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix}$

Q14. Solve for 'x': $\tan^{-1}(x+1) + \tan^{-1}(x-1) = \tan^{-1}\frac{8}{31}$.

OR

If $\tan^{-1}x + \tan^{-1}y + \tan^{-1}z = \pi$, prove that, $x+y+z = xyz$.

Q15. Using properties of determinants, prove that $\begin{vmatrix} -a^2 & ab & ac \\ ba & -b^2 & bc \\ ca & cb & -c^2 \end{vmatrix} = 4a^2b^2c^2$.

Q16. Find the interval in which the function $f(x) = \sin^4 x + \cos^4 x$, $0 \le x \le \pi/2$ is (i)increasing (ii)decreasing.

OR

Sand is pouring from a pipe from a pipe at the rate of 12 cm^3/s. The falling sand forms a cone on the ground in such a way that he height of the cone is always one- sixth of the radius of cone. How fast is the height of sand –cone increasing when the height is 4 cm.?

Q17. Using elementary transformation, find the inverse of $A = \begin{bmatrix} 2 & -3 & 3 \\ 2 & 2 & 3 \\ 3 & -2 & 2 \end{bmatrix}$.

OR

Express the matrix $A = \begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as a sum of a symmetric and a skew -symmetric matrix.

Q18. Find all points of discontinuity of F(x), where $F(x) = \begin{cases} \frac{\sin x}{x}, & if\ x < 0 \\ x+1, & if\ x \ge 0 \end{cases}$

Q19. Integrate: $\int \frac{8x+13}{\sqrt{4x+7}}\,dx$

Q20. If $y = e^{a\cos^{-1}x}$, $-1 \le x \le 1$, show that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2y = 0$

Q21. Using differentails, find the approximate value of $\sqrt{25.2}$.

Q22. Evaluate: $\int_{-1}^{3}(2x^2 + 3x + 5)\,dx$ *as limit of sums.*

Q23. Find the intervals in which the function $f(x) = (x+1)^3(x-3)^3$ is strictly increasing or decreasing.

OR

Find the equation of the tangent and the normal to the curve $x = 1 - \cos\theta$, $y = \theta - \sin\theta$ at $\theta = \pi/4$.

SECTION D

Q24. If the sum of lengths of hypotenuse and a side of a right angled triangle is given, show that the area of the triangle is maximum when the angle between them is $\frac{\pi}{3}$.

Q25. Using matrix method, solve the following system of equations:

X +y+ z = 3; x – 2y + 3z = 2; and 2x – y + z =2

Q26. Differentiate: $\tan^{-1}\left\{\frac{\sqrt{1-x^2}-1}{x}\right\}$ *with respect to* $\sin^{-1}\left\{\frac{2x}{1+x^2}\right\}$.

Q27. Prove that: $\sin^{-1}(\frac{12}{13}) + \cos^{-1}(\frac{4}{5}) + \tan^{-1}\frac{63}{16} = \pi$.

Q28. Find all points of local maxima and local minima with their values of the function $f(x) = \frac{-3}{4}x^4 + 2x^3 + \frac{9}{2}x^2 + 100$.

Q29.. Evaluate: (i) $\int \frac{1+\cos 4x}{\cot x - \tan x}\,dx$. (ii) $2\int \frac{\sqrt{\tan x}}{\sin 2x}\,dx$.

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SC F

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World law ~~[illegible]~~ India's
is a big challenge in [illegible] India