PAPER CODE - 8193

MATHEMATICS | **12th CLASS – 1st Annual 2024** | **TIME: 30 MINUTES**

GROUP : FIRST | **OBJECTIVE** | **MARKS: 20**

NOTE: You have four choices for each objective type question as A , B , C and D . The choice which you think is correct , fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question.

QUESTION NO. 1

DGK-1-24

1 Derivative of $\sqrt{x}$ w.r.t. x at x = a is
(A) $\sqrt{a}$ (B) $2\sqrt{a}$ (C) $\frac{1}{\sqrt{a}}$ (D) $\frac{1}{2\sqrt{a}}$

2 If $f(x) = x^{100}$, $f'(1) =$
(A) 0 (B) 50 (C) 99 (D) 100

3 $\int a^{\lambda x}\, dx =$
(A) $\frac{a^{\lambda x}}{\lambda} + c$ (B) $\frac{a^{\lambda x}}{\ln a} + c$ (C) $\frac{a^{\lambda x}}{\lambda \ln a} + c$ (D) $a^{\lambda x} . \ln a + c$

4 $\int e^x \left(\frac{1}{x} - \frac{1}{x^2}\right) dx =$
(A) $\frac{e^x}{x} + c$ (B) $-\frac{e^x}{x} + c$ (C) $e^x . \ln x + c$ (D) $-\frac{e^x}{x^2} + c$

5 $\int \frac{1}{x^2 + 16}\, dx =$
(A) $\tan^{-1}\left(\frac{x}{4}\right) + c$ (B) $\frac{1}{4}\tan^{-1}\left(\frac{x}{4}\right) + c$ (C) $\frac{1}{4}\tan\left(\frac{x}{4}\right) + c$ (D) $\frac{1}{2}\tan^{-1}\left(\frac{x}{4}\right) + c$

6 $\int 0\, dx =$
(A) 0 (B) 1 (C) x + c (D) constant

7 A line which pass through one vertex and mid-point of opposite side of a triangle is called
(A) Median (B) Altitude (C) Normal (D) Perpendicular bisector

8 If A(- 2 , 3) , B(- 4 , 1) and C(3 , 5) are the vertices of a triangle , then its centroid is
(A) $\left(\frac{-3}{2}, \frac{9}{2}\right)$ (B) (- 1 , 3) (C) (- 3 , 4) (D) (- 3 , 9)

9 If point (2 , - 9) lies on line px + y + 20 = 0 , then value of p is
(A) $\frac{11}{2}$ (B) $\frac{-11}{2}$ (C) $\frac{29}{2}$ (D) $\frac{-29}{2}$

10 If x > b , then which one is correct ?
(A) - x > - b (B) - x < b (C) x < b (D) - x < - b

11 The circle whose radius is 0 is called a/an
(A) Unit circle (B) Imaginary circle (C) Point circle (D) Circum circle

12 The point (- 5 , 6) lies ..... the circle $x^2 + y^2 = 61$
(A) Outside (B) Inside (C) On (D) Any where

13 The length of semi-latus rectum of hyperbola
(A) 2a (B) $\frac{b^2}{2a}$ (C) $\frac{b^2}{a}$ (D) $\frac{2b^2}{a}$

14 Which of the following is not vector quantity
(A) Weight (B) Momentum (C) Force (D) Energy

15 If vectors $\vec{a}$ and $\vec{b}$ have same direction , then $\vec{a} . \vec{b}$ =
(A) ab (B) - ab (C) $ab \sin\theta$ (D) $(ab)^2$

16 Value of $2\hat{i} \times 2\hat{j} . \hat{k}$ is
(A) 0 (B) 1 (C) 2 (D) 4

17 cosec hx is equal to .....
(A) $\frac{2}{e^x + e^{-x}}$ (B) $\frac{1}{e^x + e^{-x}}$ (C) $\frac{2}{e^x - e^{-x}}$ (D) $\frac{2}{e^{-x} - e^x}$

18 f(x) = ax + b , a ≠ 0 is a/an
(A) Linear function (B) Odd function (C) Even function (D) Identity function

19 Derivative of an identity function is
(A) 0 (B) 1 (C) – 1 (D) Identity function

20 $x^3 \frac{d}{dx}(\ln 2x) =$
(A) x^2 (B) $2x^3$ (C) $3x^2$ (D) $6x^2$

GROUP : FIRST SUBJECTIVE MARKS : 80

SECTION-I

DGK-I-24

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Express perimeter 'p' of a square as a function of its area 'A'
ii	Without finding inverse state domain and range of f^{-1} if $f(x) = (x-5)^2$, $x \geq 5$
iii	Evaluate $\lim_{x \to 1} \frac{x^2-1}{x^2-x}$
iv	Evaluate the limit $\lim_{\theta \to 0} \frac{\sin^2\theta}{\theta}$
v	Differentiate with respect to 'x' $\frac{1}{x-a}$ by definition
vi	Differentiate with respect to 'x' $\frac{a+x}{a-x}$
vii	Find $\frac{dy}{dx}$ by making suitable substitution of $y = (3x^2 - 2x + 7)^6$
viii	Differentiate with respect to 'x' $\frac{1}{a} \sin^{-1}\left(\frac{a}{x}\right)$
ix	Differentiate $(ln\ x)^x$ with respect to 'x'
x	Find y_2 if $x^2 + y^2 = a^2$
xi	Show that $\cos(x+h) = \cos x - h \sin x - \frac{h^2}{2!}\cos x + \frac{h^3}{3!} \sin x + \ldots\ldots\ldots$
xii	Find interval in which 'f' is increasing or decreasing $f(x) = \cos x$, $x \in \left(\frac{-\pi}{2}, \frac{\pi}{2}\right)$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Find δy and dy of $y = x^2 - 1$, when x changes from 3 to 3.02
ii	Evaluate $\int \frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}}\, d\theta$
iii	Find the area between the x-axis and the curve $y = 4x - x^2$
iv	Solve the differential equation $\frac{dy}{dx} = \frac{y}{x^2}$, $(y > 0)$
v	Evaluate $\int_{-1}^{3} (x^3 + 3x^2)\, dx$
vi	Evaluate $\int x\ ln\ x\ dx$
vii	Find $\int \frac{-2x}{\sqrt{4-x^2}}\, dx$
viii	Find distance between the points A(-8 , 3) ; B(2 , -1). Also find mid-point between them
ix	The coordinates of a point p are (- 6 , 9). The axes are translated through the point O′ (-3 , 2). Find the coordinates of P referred to the new axes
x	Show that points (- 4 , 6) ; (3 , 8) and (10 , 10) lie on the same line
xi	Find the distance from the point P(6 , -1) to the line $6x - 4y + 9 = 0$
xii	Find measure of the angle between the lines represented by $x^2 - xy - 6y^2 = 0$

QUESTION NO. 4 Write short answers any Nine (9) of the following 18

i	Graph the inequality $x + 3y > 6$
ii	Define feasible region and feasible solution
iii	Find the centre and radius of circle $x^2 + y^2 - 6x + 4y + 13 = 0$
iv	Find the slope of normal to the circle $x^2 + y^2 = 25$ at (4 , 3)
v	Check the position of the point (5 , 6) w.r.t circle $x^2 + y^2 = 81$
vi	Find the focus and directrix of parabola $x^2 = -16y$
vii	Find centre and foci of ellipse $25x^2 + 9y^2 = 225$
viii	Find eccentricity and vertices of $x^2 - y^2 = 9$
ix	Find a vector whose magnitude is 2 and is parallel to $-\underline{i} + \underline{j} + \underline{k}$
x	Find cosine of the angle between $\underline{u}$ and $\underline{v}$ where $\underline{u} = [-3, 5]$ and $\underline{v} = [6, -2]$
xi	Compute $\underline{a} \times \underline{b}$ and $\underline{b} \times \underline{a}$ if $\underline{a} = \underline{i} + \underline{j}$ and $\underline{b} = \underline{i} - \underline{j}$
xii	If $\underline{a} + \underline{b} + \underline{c} = 0$ then prove that $\underline{a} \times \underline{b} = \underline{b} \times \underline{c}$
xiii	Find the volume of the parallelepiped determined by $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$ and $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$

(P.T.O)

SECTION-II

DGK-1-24

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Discuss continuity of f at x = 3 , when $f(x) = \begin{cases} x-1 & if\ x<3 \\ 2x+1 & if\ x \geq 3 \end{cases}$
(B)	Prove that $y\frac{dy}{dx} + x = 0$ if $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$
Q.6- (A)	If $y = (\cos^{-1} x)^2$, prove that $(1-x^2)y_2 - xy_1 - 2 = 0$
(B)	Evaluate : $\int \sqrt{4-5x^2}\ dx$
Q.7-(A)	Evaluate $\int_0^{\pi/4} \frac{\cos\theta + \sin\theta}{2\cos^2\theta}\ d\theta$
(B)	Maximize $f(x , y) = x + 3y$ subject to the constraints $2x + 5y \leq 30$; $5x + 4y \leq 20$; $x \geq 0$; $y \geq 0$
Q.8-(A)	Find equations of the tangents drawn from (0 , 5) to $x^2 + y^2 = 16$
(B)	Prove that $\sin(\alpha - \beta) = \sin\alpha \cos\beta - \cos\alpha \sin\beta$ using vectors
Q.9-(A)	Find centre , foci , eccentricity and directrices of hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$
(B)	Find equation of line through the intersection of $x - y - 4 = 0$ and $7x + y + 20 = 0$ and perpendicular to the line $6x + y - 14 = 0$