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 centroied 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 $2\hat{\imath} \times 2\hat{\jmath} . \hat{k}$ 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 , $a \neq 0$ 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 $6x + y - 14 = 0$

MATHEMATICS
GROUP : SECOND

PAPER CODE - 8196
12th CLASS – 1st Annual 2024
OBJECTIVE

TIME: 30 MINUTES
MARKS: 20

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QUESTION NO. 1 DGK-2-24

1 $\int e^x (\sin x - \cos x)\ dx = ?$
(A) $e^x \cos x + c$ (B) $e^x \sin x + c$ (C) $-e^x \cos x + c$ (D) $-e^x \sin x + c$

2 $\int_0^{1/2} \frac{1}{\sqrt{1-x^2}}\ dx = ?$
(A) $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

3 The distance of a point P(2 , - 3) from the x – axis is equal to
(A) - 3 (B) - 2 (C) 2 (D) 3

4 If (2 , 4) , (4 , 6) and (3 , 2) are the vertices of a triangle , then coordinates of the centroid are
(A) (3 , 4) (B) (4 , 6) (C) $\left(\frac{9}{2}, 6\right)$ (D) (24 , 48)

5 The lines represented by $3x^2 - 5xy - 3y^2 = 0$ will be
(A) Parallel (B) Perpendicular (C) Neither parallel nor perpendicular (D) Tangent lines

6 $x = 2$ is the solution of
(A) $x > 1$ (B) $x < 5$ (C) $x > 7$ (D) $x \geq 9$

7 A chord which contains the centre of the circle is called
(A) Radius (B) Focal chord (C) Diameter (D) Tangent line

8 The perpendicular at the outer end of a radial segment is ..... to the circle
(A) Secant (B) Normal (C) Perpendicular (D) Tangent

9 Asymptotes of the curve $\frac{x^2}{16} - \frac{y^2}{25} = 1$ are
(A) $y = \pm \frac{5}{4}x$ (B) $y = \pm \frac{4}{5}x$ (C) $y = \frac{5}{4}\sqrt{x^2 - 16}$ (D) $y = -\frac{5}{4}\sqrt{x^2 - 16}$

10 Projection of a vector $\vec{b}$ along vector $\vec{a}$ is
(A) $\frac{\vec{a}.\vec{b}}{|\vec{b}|}$ (B) $\frac{\vec{a}.\vec{b}}{\vec{b}}$ (C) $\frac{\vec{a}.\vec{b}}{\vec{a}}$ (D) $\frac{\vec{a}.\vec{b}}{|\vec{a}|}$

11 The value of $[\hat{k}\ \hat{\imath}\ \hat{\jmath}] = ?$
(A) - 1 (B) 0 (C) 1 (D) 2

12 If three vectors $\vec{a}, \vec{b}$ and $\vec{c}$ are coplanar , then scalar triple product of these vectors is
(A) a negative number (B) a positive number (C) a non-negative number (D) zero

13 $\lim_{x \to a} \frac{x^{n-1} - a^{n-1}}{x - a} = ?$
(A) na^{n-1} (B) $(n-1)a^{n-2}$ (C) na^{n-1} (D) $(n-1)a^{n-1}$

14 If $f(x) = 2 + \sqrt{x-1}$ $\forall\ x \in \mathbb{R}$, then domain of $f^{-1}(x)$ is
(A) [-1 , + ∞) (B) [0 , + ∞) (C) [1 , + ∞) (D) [2 , + ∞)

15 $\frac{d}{dx}\left(x - \frac{\sin 2x}{2}\right) = ?$
(A) $2\sin^2 x$ (B) $2\cos^2 x$ (C) $2\sin x$ (D) $2\cos x$

16 If $f(x) = \frac{1}{12}x^4$, then $f^{(4)}(x) = ?$
(A) 0 (B) 1 (C) 2 (D) 3

17 If $xy + y^2 = 2$, then $\frac{dy}{dx} = ?$
(A) $\frac{-x}{x+2y}$ (B) $\frac{-y}{x+2y}$ (C) $\frac{xy-y}{x+2y}$ (D) $\frac{x-2y}{x-y}$

18 If $f(x) = x^2 + 2x - 3$, then $f(x)$ is decreasing in the interval
(A) (-1 , + ∞) (B) (- ∞ , - 1) (C) (- ∞ , 1) (D) (1 , 3)

19 $\int \frac{\sin x - \cos x}{\sqrt{1 - \sin 2x}}\ dx = ?$
(A) $x + c$ (B) $\sin x + c$ (C) $\cos x + c$ (D) $\cos^2 x + c$

20 $\int \frac{x}{x+2}\ dx = ?$
(A) $x + ln(x+2) + c$ (B) $x - ln(x+2)^2 + c$ (C) $x - ln(x+2) + c$ (D) $x + ln(x+2)^2 + c$

ROUP : SECOND

SUBJECTIVE

SECTION-I

DGK-2-24

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

i	Express the perimeter P of a square as a function of its area A
ii	Find the values of (fog) and (gof) when $f(x) = 2x + 1$, $g(x) = \frac{3}{x-1}$
iii	Evaluate $\lim\limits_{x \to -1} \frac{x^3 - x}{x+1}$
iv	Find c such that $\lim\limits_{x \to -1} f(x)$ exist where $f(x) = \begin{cases} x+2 , & x \leq -1 \\ c+2 , & x > -1 \end{cases}$
v	Find $\frac{dy}{dx}$ by definition when $y = 2x^2 + 1$
vi	Find $\frac{dy}{dx}$ when $y = \frac{2x-3}{2x+1}$
vii	If $x = \theta + \frac{1}{\theta}$ and $y = \theta + 1$, find $\frac{dy}{dx}$
viii	Differentiate $\sin x$ w.r.t. $\cot x$
ix	If $y = x\, e^{\sin x}$, find $\frac{dy}{dx}$
x	Find y_2 when $x = at^2$, $y = bt^4$
xi	Find the extreme values of $f(x) = 3x^2$
xii	Find y_2 when $y = 2x^5 - 3x^4 + 4x^3 + x - 2$

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

i	Use differentials to find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ of $x^4 + y^2 = xy^2$
ii	Evaluate $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}}\, dx$
iii	Evaluate $\int \frac{dx}{x^2 + 4x + 13}$
iv	Evaluate $\int x^2 \tan^{-1} x\, dx$
v	Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)}\, dx$
vi	Evaluate $\int_1^2 \frac{x^2+1}{x+1}\, dx$
vii	Solve the differential equation $\frac{dy}{dx} = \frac{1-x}{y}$
viii	Show that points A(-1 , 2) , B(7 , 5) and C(2 , - 6) are vertices of right triangle
ix	In a triangle A(8 , 6) , B(- 4 , 2) , C(- 2 , - 6) find slope of any one median of triangle
x	Find the slopes of lines l_1 and l_2 where l_1 : Joining (2 , 7) and (7 , 10) l_2 : Joining (1 , 1) and (-5 , 3)
xi	Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$
xii	Find the distance between parallel lines $2x + y + 2 = 0$, $6x + 3y - 8 = 0$

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

i	Indicate the solution set of the system of linear inequalities $3x + 7y \geq 21$, $x - y \leq 2$
ii	Define feasible region
iii	Find centre and radius of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
iv	Find vertex and directrix of parabola $(x - 1)^2 = 8(y + 2)$
v	Define axis of parabola
vi	Find an equation of hyperbola with foci $(0 , \pm 6)$ and $e = 2$
vii	Find centre and vertices of ellipse $25x^2 + 9y^2 = 225$
viii	Find equation of tangent to the conic $y^2 = 4ax$ at point (x_1 , y_1)
ix	Find direction cosines of the vector $6\hat{i} - 2\hat{j} + \hat{k}$
x	If the vectors $\underline{u} = \alpha\underline{i} + 2\alpha\underline{j} - \underline{k}$ and $\underline{v} = \underline{i} + \alpha\underline{j} + 3\underline{k}$ are perpendicular. Find the value of α
xi	Define unit vector. Also give an example
xii	Find the value of α for which $\alpha\hat{i} + \hat{j}$, $\hat{i} + \hat{j} + 3\hat{k}$ and $2\hat{i} + \hat{j} - 2\hat{k}$ are coplanar
xiii	Define cross product of two vectors $\underline{u}$ and $\underline{v}$

(P.T.O)

SECTION-II

Note: Attempt any Three questions from this section DGK-2-24 **10 x 3 = 30**

Q.5- (A)	Prove that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$
(B)	If $x = a \cos^3 \theta$, $y = b \sin^3 \theta$, show that $a \frac{dy}{dx} + b \tan \theta = 0$
Q.6- (A)	If $y = e^x \sin x$, show that $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 2y = 0$
(B)	Evaluate : $\int \sqrt{a^2 + x^2}\ dx$
Q.7-(A)	Evaluate $\int_0^1 \frac{3x}{\sqrt{4-3x}}\ dx$
(B)	Maximize $f(x , y) = x + 3y$ subject to constraints $2x + 5y \leq 30$ $5x + 4y \leq 20$; $x , y \geq 0$
Q.8-(A)	Show that the circles $x^2 + y^2 + 2x - 2y - 7 = 0$ and $x^2 + y^2 - 6x + 4y + 9 = 0$ touches externally
(B)	Use vector method to prove that $\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$
Q.9-(A)	Find an equation of the ellipse with given data centre (0 , 0) , focus (0 , - 3) , vertex (0 , 4)
(B)	If two vertices of an equilateral triangle are A(- 3 , 0) and B(3 , 0). Find the third vertex. How many of these triangles are possible ?