PAPER CODE - 8191

MATHEMATICS — 12^{th} CLASS – 12022 — TIME: 30 MINUTES

GROUP : FIRST — DGK-G1-22 — **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 mark in that question.

QUESTION NO. 1

1 $\lim_{x \to +\infty} \frac{2-3x}{\sqrt{3+4x^2}} = \ldots\ldots\ldots\ldots$
(A) 3/2 (B) -3/2 (C) $+\infty$ (D) $-\infty$

2 If $f(x) = \begin{cases} x+2 & x \le -1 \\ c+2 & x > -1 \end{cases}$ and $\lim_{x \to -1} f(x)$ exists then c = ...
(A) -2 (B) 2 (C) 1 (D) -1

3 $\frac{d}{dx} \sinh^{-1} x = \ldots\ldots\ldots\ldots$
(A) $\frac{1}{\sqrt{1+x^2}}$ (B) $\frac{-1}{\sqrt{1+x^2}}$ (C) $\frac{1}{\sqrt{1-x^2}}$ (D) $\frac{-1}{\sqrt{1-x^2}}$

4 Any point where function f is neither increasing nor decreasing provided $f'(x) = 0$ is called
(A) Critical point (B) Point of inflection (C) Stationary point (D) Feasible point

5 $\frac{d}{dx} \cos(ax+b) = \ldots\ldots\ldots\ldots$
(A) $\sin(ax+b)$ (B) $-a\sin(ax+b)$ (C) $a\sin(ax+b)$ (D) $-\sin(ax+b)$

6 $\frac{d}{dx} e^{3x} = \ldots\ldots\ldots\ldots$
(A) $\frac{1}{3} e^{3x}$ (B) e^{3x} (C) $3e^{3x}$ (D) $3e^{3x} \ln 3$

7 $\int_{-\pi}^{\pi} \sin x \, dx = \ldots\ldots\ldots\ldots$
(A) -1 (B) 0 (C) 1 (D) cos x

8 $\int \frac{e^x}{e^x+3} dx = \ldots\ldots\ldots\ldots$
(A) $e^x + 3 + c$ (B) $e^x + c$ (C) $e^x \ln(e^x+3) + c$ (D) $\ln(e^x+3) + c$

9 $\int \frac{x}{\sqrt{4+x^2}} dx = \ldots\ldots\ldots\ldots$
(A) $\sqrt{4+x^2} + c$ (B) $\frac{1}{2}\sqrt{4+x^2}$ (C) $\frac{1}{(x+4)^{3/2}} + c$ (D) $\ln\left|\sqrt{4+x^2}\right| + c$

10 Solution of differential equation $\frac{dy}{dx} = -y$ is
(A) $y = -ce^x$ (B) $y = ce^x$ (C) $y = ce^{-x}$ (D) $y = e^x$

11 The distance between the points A (3 , 1) , B (-2 , - 4)
(A) $2\sqrt{5}$ (B) $5\sqrt{2}$ (C) $\sqrt{5}$ (D) $\sqrt{2}$

12 The point of intersection of the lines $3x + y + 12 = 0$ and $x + 2y - 1 = 0$ is
(A) (5 , 3) (B) (-5 , - 3) (C) (5 , - 3) (D) (-5 , 3)

13 Slope of the line $2x + 5y - 8 = 0$ is
(A) -2/5 (B) 2/5 (C) 5/2 (D) -5/2

14 The y-intercept of the equation of line $5x - 12y + 39 = 0$
(A) $\frac{5}{12}$ (B) $\frac{-39}{12}$ (C) $\frac{39}{12}$ (D) $\frac{-5}{12}$

15 Graph of the inequality $x + 2y < 6$ lies ....
(A) Opposite to origin (B) Toward origin (C) in 1st quadrant (D) in 2nd quadrant

16 Radius of the circle with equation $x^2 + y^2 + 2gx + 2fy + c = 0$ is
(A) $\sqrt{g^2+f^2+c}$ (B) $\sqrt{g^2-f^2-c}$ (C) $\sqrt{g^2+f^2-c^2}$ (D) $\sqrt{g^2+f^2-c}$

17 The line through the focus and perpendicular to the directrix of parabola is called
(A) tangent to parabola (B) axis of parabola (C) latusrectum of parabola (D) vertex of parabola

18 $x = a\cos\theta$, $y = b\sin\theta$ are parametric equations of ....
(A) Circle (B) Parabola (C) Ellipse (D) Hyperbola

19 If $\underline{u}$ and $\underline{v}$ be two vectors making an angle θ with each other then projection of $\underline{u}$ along $\underline{v}$ is
(A) $\frac{\underline{u} \cdot \underline{v}}{|\underline{v}|}$ (B) $\frac{\underline{u} \cdot \underline{v}}{|\underline{u}|}$ (C) $\frac{\underline{u} \times \underline{v}}{|\underline{v}|}$ (D) $\frac{\underline{u} \times \underline{v}}{|\underline{u}|}$

20 $3\underline{j} \cdot \underline{k} \times \underline{i} = \ldots\ldots\ldots\ldots$
(A) 0 (B) - 3 (C) $\underline{j}$ (D) 3

MATHEMATICS 12th CLASS - 12022 TIME : 2.30 HOURS
GROUP : FIRST SUBJECTIVE MARKS : 80

SECTION-I

QUESTION NO. 2 Write short answers any Eight (8) of the following DGK-G1-22 **16**

i	Prove the identity $\sec h^2 x = 1 - \tan h^2 x$
ii	If $f(x) = 2x + 1$ and $g(x) = x^2 - 1$. The obtain the expression $fg(x)$
iii	Obtain $f^{-1}(x)$ from $f(x) = -2x + 8$
iv	Evaluate $\lim_{x\to 0} \frac{\sin x^\circ}{x}$
v	If $f(x) = \begin{cases} x+2, & x \le -1 \\ c+2, & x > -1 \end{cases}$, find " c " so that $\lim_{x\to -1} f(x)$ exists
vi	If $y = \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$, then find $\frac{dy}{dx}$
vii	Differentiate $x^2 - \frac{1}{x^2}$ w.r.t. " x^4 "
viii	If $y = x^2 \sec 4x$, then find $\frac{dy}{dx}$
ix	Obtain $f'(x)$ from $f(x) = x^3 \cdot e^{1/x}$
x	Find $\frac{dy}{dx}$ if $y = x e^{\sin x}$
xi	Determine the interval in which $f(x) = 4 - x^2$, $x \in (-2, 2)$ is increasing
xii	Examine the function $f(x) = x^2 - x - 2$ for critical values

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

i	Use differentials to find $\frac{dy}{dx}$ if $xy + x = 4$
ii	Find $\int \frac{dx}{\sqrt{x+1} - \sqrt{x}}$
iii	Find $\int x \cdot \sqrt{x^2 - 1}\, dx$
iv	Find $\int \frac{x^2}{x^2+4}\, dx$
v	Find $\int \tan^{-1}x\, dx$
vi	Find $\int e^{-x} (\cos x - \sin x)\, dx$
vii	$\int_{-6}^{2} \sqrt{3-x}\, dx$
viii	Solve the differential equation $\frac{dy}{dx} = \frac{y}{x^2}$
ix	Find the equation of a vertical line through (-5 , 3)
x	Convert the equation $2x - 4y + 11 = 0$ (i) Two intercepts form (ii) Normal form
xi	Check whether the point (5 , 8) lies below or above the line $2x - 3y + 6 = 0$
xii	Find the lines represented by $3x^2 + 7xy + 2y^2 = 0$

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

i	Graph the solution set of $3x - 2y \ge 6$
ii	Graph the solution set of the following linear inequality $3x + 7y \ge 21$, $y \le 4$
iii	If $\underline{v} = \frac{-\sqrt{3}}{2}\underline{i} - \frac{1}{2}\underline{j}$. then find a unit vector in the direction of $\underline{v}$
iv	If $\underline{u} = 2\underline{i} + 3\underline{j} + \underline{k}$, $\underline{v} = 4\underline{i} + 6\underline{j} + 2\underline{k}$ and $\underline{w} = -6\underline{i} - 9\underline{j} - 3\underline{k}$ then find $\underline{u} + 2\underline{v}$
v	If $\underline{a} = 2\underline{i} - 2\underline{j} + 4\underline{k}$, $\underline{b} = -\underline{i} + \underline{j} - 2\underline{k}$ then find a unit vector perpendicular to plane containing $\underline{a}$ and $\underline{b}$
vi	If $\underline{u} = \underline{i} + 2\underline{j} - \underline{k}$, $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$ and $\underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$. Then find volume of parallelepiped by these vectors
vii	Find work done , if the point at which the constant force $\underline{F} = 4\underline{i} + 3\underline{j} + 5\underline{k}$ is applied to an object moves from $P_1 (3, 1, -2)$ to $P_2 (2, 4, 6)$
viii	Write equation of normal to the circle $x^2 + y^2 = 25$ at $(5\cos\theta, 5\sin\theta)$
ix	Find focus of the parabola $x^2 - 4x - 8y + 4 = 0$
x	Find eccentricity and vertices of the hyperbola $\frac{x^2}{16} - \frac{y^2}{9} = 1$
xi	Define circle and write equation of circle in standard form
xii	Find equation of the parabola with focus (2 , 5) and directrix $y = 1$
xiii	Find centre and foci of the hyperbola $\frac{y^2}{4} - x^2 = 1$

SECTION-II

Note: Attempt any Three questions from this section DGK-G1-22 **10 x 3 = 30**

Q.5- (A)	If $x = \frac{1-t^2}{1+t^2}$, $y = \frac{2t}{1+t^2}$, then show $y\frac{dy}{dx} + x = 0$
(B)	Find m and n so that the given function is continuous at $x = 3$ if $f(x) = \begin{cases} mx & \text{if } x < 3 \\ n & \text{if } x = 3 \\ -2x+9 & \text{if } x > 3 \end{cases}$
Q.6- (A)	Find $\int \sin^4 x \; dx$
(B)	Find the equation of the line through (5 , - 8) and perpendicular to join of A(-15 , -8), B(10 , 7)
Q.7-(A)	Evaluate $\int_{-1}^{2} (x + \lvert x \rvert) \; dx$
(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 the area of the region bounded by the triangle whose sides are $7x - y - 10 = 0$; $10x + y - 41 = 0$; $3x + 2y + 3 = 0$
(B)	Determine the equations of tangents to the circle $x^2 + y^2 = 2$ perpendicular to the line $3x + 2y = 6$
Q.9-(A)	By transforming the equation $x^4 + 4y^2 - 2x + 8y + 4 = 0$ referred to a new origin and axes remaining parallel to the original axes , the first terms are removed. Find the coordinates of the new origin and the transformed equation
(B)	Prove that : $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$

PAPER CODE - 8192

MATHEMATICS — 12th CLASS – 12022 — **TIME: 30 MINUTES**

GROUP : SECOND — **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 mark in that question.

QUESTION NO. 1 DGK-G2-22

1. $\lim_{n \to +\infty} \left(1+\frac{1}{n}\right)^{\frac{n}{2}} = \ldots\ldots$
   (A) e^n (B) e (C) $e^{1/2}$ (D) $e^{-1/2}$
2. If $f(x) = 2x+1$, $g(x) = \frac{3}{x-1}$ $x \neq 1$ then $fog(x) = \ldots\ldots$
   (A) $\frac{5+x}{x-1}$ (B) $\frac{3}{2x}$ (C) $4x+3$ (D) $\frac{3(x-1)}{4-x}$
3. $\frac{d}{dx}$ $\coth^{-1} x = \ldots\ldots$
   (A) $\frac{1}{1-x^2}$ (B) $\frac{1}{x^2-1}$ (C) $\frac{1}{1+x^2}$ (D) $\frac{-1}{1+x^2}$
4. $\frac{d}{dx}(x+4)^{1/3} = \ldots\ldots$
   (A) $(x+4)^{-1/3}$ (B) $\frac{1}{3}(x+4)^{-1/3}$ (C) $\frac{1}{3}(x+4)^{-2/3}$ (D) $\frac{1}{3}(x+4)^{2/3}$
5. $\frac{d}{dx} e^{\sin x} = \ldots\ldots$
   (A) $e^{\sin x}$ (B) $\cos x\, e^{\sin x}$ (C) $\sin x\, e^{\sin x-1}$ (D) $-\cos x\, e^{\sin x}$
6. If f be a differentiable function on the open interval (a , b) then f is increasing function if ……
   (A) $f'(x) < 0$ (B) $f'(x) > 0$ (C) $f'(x) \leq 0$ (D) $f''(x) < 0$
7. $\int \frac{1}{ax+b} dx = \ldots\ldots$
   (A) $\ln|ax+b| + c$ (B) $\frac{ax+b}{a} + c$ (C) $\frac{-a}{(ax+b)^2} + c$ (D) $\frac{1}{a}\ln|ax+b| + c$
8. $\int (f(x))^{-1} f'(x)\, dx = \ldots\ldots$
   (A) $\ln|f(x)| + c$ (B) $\frac{[(f(x))^{-1}]^2}{2} + c$ (C) $(f(x))^{-1} + c$ (D) $f(x) + c$
9. $\int \tan^2 x\, dx = \ldots\ldots$
   (A) $\sec^2 x + c$ (B) $\sec^2 x - x + c$ (C) $x - \sec^2 x + c$ (D) $-\operatorname{cosec}^2 x + c$
10. Solution of the differential equation $x\frac{dy}{dx} = 1 + y$ is ……
    (A) $c - \frac{1}{x}$ (B) ce^y (C) $y = cx - 1$ (D) $x^2 + y^2 = c$
11. Equation of horizontal line through (7 , - 9) is ……
    (A) y = - 9 (B) y = 9 (C) x = 7 (D) x = -7
12. Slope intercept form of the line $2x + y - 11 = 0$ is
    (A) $\frac{x}{(11/2)} + \frac{y}{11} = 1$ (B) $y = -2x + 11$ (C) $y = 2x - 11$ (D) $y = -2x - 11$
13. If $\theta = 45^\circ$ be the inclination of the line with x-axis then slope of the line is ……
    (A) $\frac{-1}{\sqrt{2}}$ (B) $\frac{1}{\sqrt{2}}$ (C) -1 (D) 1
14. The equation $ax^2 + 2hxy + by^2 = 0$ represents a pair of orthogonal lines if
    (A) $h^2 - ab = 0$ (B) $a + b = 0$ (C) $h^2 + ab = 0$ (D) $a - b = 0$
15. The non-negative constraints used in a system of linear in equalities are called
    (A) Problem constraints (B) Decision variable (C) Feasible solution (D) Optimal solution
16. Co-ordinate of the centre of the circle $x^2 + y^2 + 12x - 10y = 0$ is
    (A) (6 , - 5) (B) (- 6 , - 5) (C) (- 6 , 5) (D) (6 , 5)
17. Focus of the parabola $x^2 = -4ax$ is
    (A) (0 , - a) (B) (0 , a) (C) (- a , 0) (D) (a , 0)
18. Equation of Directrices of Hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$
    (A) y = 0 (B) x = 0 (C) $y = \pm\frac{c}{e^2}$ (D) $x = \pm\frac{c}{e^2}$
19. The value of $[\underline{i}\ \ \underline{i}\ \ \underline{k}] = \ldots\ldots$
    (A) 1 (B) 0 (C) -1 (D) $\underline{k}$
20. With usual notations in any triangle ABC c cos A + a cos c = ……
    (A) a (B) b (C) c (D) 1

MATHEMATICS
GROUP : SECOND

12th CLASS - 12022
SUBJECTIVE

D

TIME : 2.30 HOURS
MARKS : 80

SECTION-I

QUESTION NO. 2 Write short answers any Eight (8) of the following DGK-G2-22 **16**

i	If $f(x) = x^2 - x$, Evaluate $f(x-1)$
ii	Explain Identity function by example
iii	Evaluate $\lim_{x \to \pi} \frac{\sin x}{\pi - x}$
iv	Show that $x = a \cos t$ and $y = a \sin t$ are the parametric equation of the circle $x^2 + y^2 = a^2$
v	Express $\lim_{n \to +\infty} \left(1 + \frac{3}{n}\right)^{2n}$ in terms of e
vi	If $x = t^2 + 1$, $y = t^2$ find $\frac{dy}{dx}$
vii	If $3x + 4y + 7 = 0$ then find $\frac{dy}{dx}$
viii	Differentiate $\frac{1}{a} \sin^{-1} \frac{a}{x}$ w.r.t x
ix	Find y_2 if $x^2 + y^2 = a^2$
x	Explain increasing function and give its example
xi	Differentiate $\sin x$ w.r.t $\cot x$
xii	Calculate $\frac{d}{dx} (3 x^{4/3})$

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

i	Evaluate $\int \frac{\cos 2x - 1}{1 + \cos 2x} dx$
ii	Evaluate $\int a^{x^2} x \, dx$
iii	Evaluate $\int \frac{dx}{\frac{1}{2}\sin x + \frac{\sqrt{3}}{2}\cos x}$
iv	Evaluate $\int (\text{en } x)^2 \, dx$
v	Find $\int_{-1}^{3} (x^3 + 3x^2) \, dx$
vi	If $\int_{-2}^{1} f(x) \, dx = 5$ and $\int_{-2}^{1} g(x) \, dx = 4$ Then evaluate $\int_{-2}^{1} (2f(x) + 3\, g(x)) \, dx$
vii	Find area between the x-axis and the curve $y = 4x - x^2$
viii	Check $y = \tan (e^x + c)$ is a solution of the differential equation of $\frac{dy}{dx} = \frac{y^2+1}{e^{-x}}$
ix	If the vertices of a triangular region are A(5 , 3) , B(-2 , 2) and C(4 , 2) . Find its area
x	Convert $5x - 12y + 39 = 0$ into slope intercept and intercept form
xi	Find the point three-fifth of the way along line segment from A(-5 , 8) to B(5 , 3)
xii	By means of slope show that the points (4 , -5) , (5 , 7) and (10 , 15) lies on a same line

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

i	Graph the solution set of linear inequality $3y - 4 \leq 0$ in xy – plane
ii	Define feasible region and feasible solution
iii	Find an equation of the circle with centre at $(\sqrt{2}, -3\sqrt{3})$ and radius $2\sqrt{2}$
iv	Find the focus and directrix of the parabola $y^2 = -8(x - 3)$
v	Find an equation of the ellipse with foci $(-3\sqrt{3}, 0)$ and vertices $(\pm 6, 0)$
vi	Find focus of the parabola $x^2 - 4x - 8y + 4 = 0$
vii	Check the position of the point (5 , 6) with respect to the circle $x^2 + y^2 = 81$
viii	Find the centre and radius of the circle $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
ix	Write the vector $\underline{PQ}$ in the form $x\underline{i} + y\underline{j}$ if P(0 , 5) , Q(-1 , - 6)
x	Find the sum of the vectors $\underline{AB}$ and $\underline{CD}$ given that four points A(1 , -1) , B(2 , 0) , C(-1 , 3) , D(-2 , 2)
xi	Find a unit vector in the direction of $\underline{V} = \underline{i} + 2\underline{j} - \underline{k}$
xii	Find the cosines of angle θ between $\underline{U} = [2, -3, 1]$, $\underline{V} = [2, 4, 1]$
xiii	Prove that $\underline{a} \times (\underline{b} + \underline{c}) + \underline{b} \times (\underline{c} + \underline{a}) + \underline{c} \times (\underline{a} + \underline{b}) = 0$

(P.T.O)

SECTION-II

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

DGK-G2-22

Q.5- (A)	Find $\lim_{\theta \to 0} \dfrac{\tan\theta - \sin\theta}{\sin^3\theta}$
(B)	Prove that if $\frac{y}{x} = \tan^{-1}\frac{x}{y}$ then $\frac{dy}{dx} = \frac{y}{x}$
Q.6- (A)	Evaluate $\int \dfrac{x + \sin x}{1 + \cos x}\, dx$
(B)	Find an equation of line through (- 4 , 7) and parallel to the line $2x - 7y + 4 = 0$
Q.7-(A)	Evaluate $\int_0^{\pi/4} \dfrac{\sec\theta}{\sin\theta + \cos\theta}\, d\theta$
(B)	Graph the feasible region of the system of linear inequalities and find the corner points of $3x + 2y \geq 6$, $x + y \leq 4$, $x \geq 0$, $y \geq 0$
Q.8-(A)	Find a joint equation of the straight lines through the origin perpendicular to the lines represented by $x^2 + xy - 6y^2 = 0$
(B)	Find equation of the tangent drawn from (0 , 5) to $x^2 + y^2 = 16$
Q.9-(A)	Find the centre , foci , eccentricity , vertices and equations of directrices of $\frac{y^2}{4} - x^2 = 1$
(B)	Prove that : $\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$