PAPER CODE - 8191

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

GROUP : FIRST — OBJECTIVE — MARKS: 20

D

DGK-G1-22

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	$\lim_{x \to +\infty} \frac{2-3x}{\sqrt{3+4x^2}} =$ .... (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	$\frac{d}{dx} \sinh^{-1} x =$ .... (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	$\frac{d}{dx} \cos(ax+b) =$ .... (A) $\sin(ax+b)$ (B) $-a\sin(ax+b)$ (C) $a\sin(ax+b)$ (D) $-\sin(ax+b)$
6	$\frac{d}{dx} e^{3x} =$ .... (A) $\frac{1}{3} e^{3x}$ (B) e^{3x} (C) $3e^{3x}$ (D) $3e^{3x} \ln 3$
7	$\int_{-\pi}^{\pi} \sin x \, dx =$ .... (A) -1 (B) 0 (C) 1 (D) cos x
8	$\int \frac{e^x}{e^x+3} dx =$ .... (A) $e^x + 3 + c$ (B) $e^x + c$ (C) $e^x \ln(e^x+3) + c$ (D) $\ln(e^x+3) + c$
9	$\int \frac{x}{\sqrt{4+x^2}} dx =$ .... (A) $\sqrt{4+x^2} + c$ (B) $\frac{1}{2}\sqrt{4+x^2}$ (C) $\frac{1}{(x+4)^{3/2}} + c$ (D) $\ln\lvert\sqrt{4+x^2}\rvert + c$
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) $\frac{\underline{u} \cdot \underline{v}}{\lvert\underline{v}\rvert}$ (B) $\frac{\underline{u} \cdot \underline{v}}{\lvert\underline{u}\rvert}$ (C) $\frac{\underline{u} \times \underline{v}}{\lvert\underline{v}\rvert}$ (D) $\frac{\underline{u} \times \underline{v}}{\lvert\underline{u}\rvert}$
20	$3\underline{j} \cdot \underline{k} \times \underline{i} =$ .... (A) 0 (B) - 3 (C) $\underline{j}$ (D) 3

MATHEMATICS | 12^{th} 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 $\lim_{x \to 0} \frac{\sin x^o}{x}$
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 $f(x) = x^3 . e^{1/x}$
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 $\int x . \sqrt{x^2 - 1}\ dx$
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 $\frac{y^2}{4} - x^2 = 1$

(P.T.O)

SECTION-II

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

DGK-G1-22

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 $\int_{-1}^{2} (x + \|x\|) \; dx$
(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 : $\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$