Paper Code Number: **4195**	2023 (1st-A) INTERMEDIATE PART-II (12th Class)	Roll No: ______________
MATHEMATICS PAPER-II	**GROUP-I** MTN-12-1-23	
TIME ALLOWED: 30 Minutes	**OBJECTIVE**	**MAXIMUM MARKS: 20**

Q.No.1 **You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.**

S.#	QUESTIONS	A	B	C	D
1	Slope of line perpendicular to the line $x + 2y + 3 = 0$ is:	$-\frac{1}{2}$	$\frac{1}{2}$	2	$\frac{3}{2}$
2	Distance of the point (3, 2) from x-axis is:	2	3	5	6
3	The lines ℓ_1, ℓ_2 with slopes m_1 and m_2 are parallel if:	$m_1 + m_2 = 0$	$m_1 m_2 = 1$	$m_1 m_2 = -1$	$m_1 = m_2$
4	$x = 5$ is the solution of inequality:	$2x + 3 < 0$	$2x - 3 > 0$	$x + 1 < 0$	$x < 0$
5	The centre of the circle $(x+1)^2 + (y+2)^2 = 16$ is:	(1, 2)	(−1, 2)	(−1, −2)	(1, −2)
6	An angle in semi-circle is of measure:	30^o	45^o	60^o	90^o
7	The parabola $y^2 = 4ax;\ a > 0$ opens towards:	Left	Right	Upward	Downward
8	In an ellipse, the foci lie on:	Major axis	Minor axis	Directrices	Centre
9	Work done by a constant force $\vec{F}$ during displacement $\vec{d}$ is equal to	$\vec{F} \times \vec{d}$	$\vec{F}\,\vec{d}$	$\vec{F} \cdot \vec{d}$	$\vec{d} \times \vec{F}$
10	If $\vec{a}$ and $\vec{b}$ are two non-zero vectors, then $\vec{a} \times \vec{b} =$	ab	$\vec{a} \cdot \vec{b}$	$\vec{b} \times \vec{a}$	$-\vec{b} \times \vec{a}$
11	$\lim_{x \to +\infty} (e^{x}) =$	$-\infty$	0	1	$+\infty$
12	$f(x) = x^3$ is a/an:	Odd function	Even function	Neither even nor odd	Constant function
13	If $C \in D_f$ and $f'(C) = 0$ or $f'(C)$ does not exist, then the number C is called:	Increasing value	Decreasing value	Stationary value	Critical value
14	$1 + x + \frac{x^2}{\lfloor 2} + \frac{x^3}{\lfloor 3} + \ldots\ldots\ldots =$	$\sin x$	$\cos x$	e^x	e^{2x}
15	$\frac{d}{dx}(a^x) =$	a^x	$a^x . \ell na$	$\frac{a^x}{\ell na}$	$\frac{\ell na}{a^x}$
16	The notation $f'(x)$ is used by the mathematician:	Lagrange	Newton	Cauchy	Leibniz
17	$\int \tan x\, dx =$	$\ell n\lvert\sin x\rvert + c$	$\ell n\lvert\cos x\rvert + c$	$\ell n\lvert\sec x\rvert + c$	$\ell n\lvert\tan x\rvert + c$
18	$\int \left(\frac{1}{x} + \frac{\sin 2x}{\sin^2 x}\right) dx =$	$\ell n \sin 2x + c$	$\ell n(x\sin^2 x) + c$	$\ell n(x\cos^2 x) + c$	$\ell n(x\sin 2x) + c$
19	$\int e^{2x} dx =$	$2e^{2x} + c$	$e^{2x} + c$	$2xe^{2x} + c$	$\frac{e^{2x}}{2} + c$
20	$\int_0^{\pi/2} \cos x\, dx =$	0	1	2	3

2023 (1^{st}-A) INTERMEDIATE PART-II (12^{th} Class)		Roll No: MTN-21-23
MATHEMATICS PAPER-II GROUP-I		
TIME ALLOWED: 2.30 Hours	**SUBJECTIVE**	**MAXIMUM MARKS: 80**

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. $8 \times 2 = 16$

(i)	What is a function?	(ii)	Prove the identity $\cosh^2 x - \sinh^2 x = 1$
(iii)	Given that $f(x) = x^3 - 2x^2 + 4x - 1$ find $f\left(\frac{1}{x}\right)$	(iv)	Differentiate w.r.t. x $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2$
(v)	Find $\frac{dy}{dx}$ if $\sqrt{x+\sqrt{x}}$	(vi)	Find $\frac{dy}{dx}$ if $y = x\cos y$
(vii)	Differentiate $y = e^{f(x)}$ w.r.t. x	(viii)	Differentiate $\sin x$ w.r.t. $\cot x$
(ix)	Find y_4 if $y = \sin 3x$	(x)	What is a stationary point?
(xi)	Define problem constraint.	(xii)	Define feasible region and feasible solution.

3. Attempt any eight parts. $8 \times 2 = 16$

(i)	Find δy and dy, if $y = x^2 - 1$, when x changes from 3 to 3.02.	(ii)	Evaluate $\int \sin(a+b)x\,dx$
(iii)	Evaluate $\int \frac{-2x}{\sqrt{4-x^2}}dx$	(iv)	Evaluate $\int x.\ln x\,dx$
(v)	Evaluate $\int_1^2 (x^2+1)\,dx$	(vi)	Find the area between the $x-$axis and the curve $y = \sin 2x$ from $x = 0$ to $x = \pi/3$
(vii)	Solve $\frac{dy}{dx} = -y$	(viii)	Find the unit vector of $\underline{v} = 2\underline{i} - \underline{j}$
(ix)	Write direction consines of $\underline{v} = 4\underline{i} - 5\underline{j}$	(x)	Find the cosine of the angle θ between $\underline{u}$ and $\underline{v}$, $\underline{u} = [2, -3, 1]$, $\underline{v} = [2, 4, 1]$
(xi)	Prove that $\underline{a} \times (\underline{b} + \underline{c}) + \underline{b} \times (\underline{c} + \underline{a}) + \underline{c} \times (\underline{a} + \underline{b}) = 0$	(xii)	Find the volume of the parallelepiped for which the given vectors are $\underline{u} = \underline{i} - 4\underline{j} - \underline{k}$; $\underline{v} = \underline{i} - \underline{j} - 2\underline{k}$; $\underline{w} = 2\underline{i} - 3\underline{j} + \underline{k}$

4. Attempt any nine parts. $9 \times 2 = 18$

(i)	Find h such that $A(-1, h)$, $B(3, 2)$ and $C(7, 3)$ are collinear.
(ii)	The $xy-$coordinate axes are rotated about the origin through an angle of 30^o. If the $xy-$coordinates of a point are (5, 7), find its $XY-$coordinates, where OX and OY are the axes obtained after rotation.
(iii)	Find the distance between the parallel lines $2x + y + 2 = 0$ and $6x + 3y - 8 = 0$
(iv)	Check whether the point $(-2, 4)$ lies above or below the line $4x + 5y - 3 = 0$
(v)	Find the area of the region bounded by the triangle with vertices $(a, b+c)$, $(a, b-c)$ and $(-a, c)$
(vi)	By means of slopes, show that the following points lie on the same line $(-4, 6)$, $(3, 8)$, $(10, 10)$
(vii)	Find an equation of the line bisecting the first and third quadrants.
(viii)	Find the centre and radius of the circle with the equation $4x^2 + 4y^2 - 8x + 12y - 25 = 0$
(ix)	Find the length of the tangent from the point $P(-5, 10)$ to the circle $5x^2 + 5y^2 + 14x + 12y - 10 = 0$
(x)	Write an equation of the parabola with given elements focus $(-3, 1)$, directrix $x - 2y - 3 = 0$
(xi)	Find an equation of the ellipse with vertices $(0, \pm 5)$ and eccentricity $\frac{3}{5}$.
(xii)	Find an equation of the hyperbola with the given data. Foci $(2 \pm 5\sqrt{2}, -7)$ and length of transverse axis 10.
(xiii)	Find an equation of the circle with ends of diameter at $(-3, 2)$ and $(5, -6)$

SECTION-II

NOTE: Attempt any three questions. $3 \times 10 = 30$

5.(a)	Evaluate $\lim_{\theta \to 0} \frac{\tan\theta - \sin\theta}{\sin^3\theta}$	(b)	If $x = a\cos^3\theta$, $y = b\sin^3\theta$ then show that $a\frac{dy}{dx} + b\tan\theta = 0$
6.(a)	Evaluate $\int \frac{dx}{\sqrt{7 - 6x - x^2}}$	(b)	Find the equation of perpendicular bisector of the segment joining the points $A(3, 5)$ and $B(9, 8)$
7.(a)	Evaluate $\int_{\pi/6}^{\pi/4} \cos^2\theta \cot^2\theta\, d\theta$	(b)	Maximize $f(x, y) = 2x + 3y$ subject to constraints $2x + y \le 8$, $x + 2y \le 14$, $x \ge 0$, $y \ge 0$

8.(a)	If $y = a\cos(\ln x) + b\sin(\ln x)$, prove that $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0$
(b)	Find the length of the chord cut from the line $2x + 3y = 13$ by the circle $x^2 + y^2 = 26$
9.(a)	Show that an equation of the parabola with focus at $(a\cos\alpha, a\sin\alpha)$ and directrix $x\cos\alpha + y\sin\alpha + a = 0$ is $(x\sin\alpha - y\cos\alpha)^2 = 4a(x\cos\alpha + y\sin\alpha)$
(b)	Prove that the line segment joining mid points of two sides of a triangle is parallel to third side and half as long.

Paper Code Number: **4196**	2023 (1^{st}-A) **INTERMEDIATE PART-II (12^{th} Class)**	Roll No: ____________

MATHEMATICS PAPER-II GROUP-II MTN-12-2-23

TIME ALLOWED: 30 Minutes **OBJECTIVE** **MAXIMUM MARKS: 20**

Q.No.1 **You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that bubble in front of that question number, on bubble sheet. Use marker or pen to fill the bubbles. Cutting or filling two or more bubbles will result in zero mark in that question.**

S.#	QUESTIONS	A	B	C	D
1	Slope of line which is perpendicular to $y-$axis is:	0	1	2	Undefined
2	$y-$intercept of the line $2x+3y-5=0$ is:	$2/5$	$5/2$	$3/5$	$5/3$
3	The point of intersection of medians of a triangle is called:	Incentre	Centroid	Circumcentre	Orthocenter
4	(0, 1) is the solution of inequality:	$x-3y>0$	$x-5y<0$	$x+y>0$	$x<0$
5	The end points of minor axis of the ellipse are called its:	Vertices	Co-vertices	Foci	Eccentricity
6	The length of latus rectum of parabola $y^2=-8x$ is:	-8	-4	4	8
7	The vertex of the parabola $(x+1)^2=8(y-2)$ is:	$(-1, 2)$	$(1, -2)$	$(-1, -2)$	$(1, 2)$
8	The length of diameter of the circle $x^2+y^2=16$ is:	4	6	8	16
9	$\bar{u}\times(\bar{v}.\bar{w})$ is:	Scalar product	Vector product	Inner product	Meaningless
10	The value of $[\hat{i}\ \ \hat{j}\ \ \hat{k}]$	-1	0	1	2
11	$\lim_{x\to-\infty}(e^x)=$	$-\infty$	0	1	$+\infty$
12	$f(x)=\sin x$ is:	Odd function	Even function	Constant function	Linear function
13	If $y=x+\frac{1}{x}$, then $\frac{dy}{dx}=$	$1-\frac{1}{x}$	$\frac{1}{x}-1$	$1-\frac{1}{x^2}$	$\frac{1}{x^2}-1$
14	If $y=\sinh^{-1}x$, then $\frac{dy}{dx}=$	$\frac{1}{\sqrt{x^2+1}}$	$\frac{1}{\sqrt{x^2-1}}$	$\frac{-1}{\sqrt{x^2+1}}$	$\frac{-1}{\sqrt{x^2-1}}$
15	Derivative of $\cos x$ w.r.t. $\cos x$ is:	$-\sin x$	$\sin x$	0	1
16	The function $f(x)=3x^2$ has minimum value at $x=$	-1	0	1	2
17	$\int_{\pi}^{\pi}\sin x\,dx=$	0	1	2	3
18	If $y=x^3$, then $dy=$	$3x^2$	x^2dx	$3x^2dx$	$3xdx$
19	$\int_a^b f(x)dx=$	$\int_b^a f(x)dx$	$-\int_b^a f(x)dx$	$\int_{-a}^{-b} f(x)dx$	$-\int_{-a}^{-b} f(x)dx$
20	$\int\frac{f'(x)}{f(x)}dx=$	$\ell n f(x)+c$	$\ell n f'(x)+c$	$\ell n f(x)f'(x)+c$	$\ell nx+c$

INTERMEDIATE PART-II (12th Class)	2023 (1st-A)	Roll No: __________
MATHEMATICS PAPER-II GROUP-II		
TIME ALLOWED: 2.30 Hours	SUBJECTIVE	MAXIMUM MARKS: 80

NOTE: Write same question number and its parts number on answer book, as given in the question paper.

SECTION-I

MTN-12-2-23

$8 \times 2 = 16$

2. Attempt any eight parts.

(i)	Define a polynomial function of degree n.	(ii)	Determine whether given function f is even or odd $f(x) = x^{2/3} + 6$
(iii)	Evaluate $\lim_{n \to \infty}\left(1 + \frac{3}{n}\right)^{2n}$	(iv)	Find the derivative of $x^{\frac{2}{3}}$ and also calculate the value of derivative at $x = 8$.
(v)	Differentiate w.r.t. x $x^{-3} + 2x^{-\frac{3}{2}} + 3$	(vi)	Find $\frac{dy}{dx}$ if $xy + y^2 = 2$
(vii)	Find $\frac{dy}{dx}$ if $x = y\sin y$	(viii)	Differentiate w.r.t. x $x^2 \sec 4x$
(ix)	Find $\frac{dy}{dx}$ if $y = e^{x^2+1}$	(x)	State Maclaurin's series expansion.
(xi)	Define optimal solution.	(xii)	Define the associated emotion of an inequality.

$8 \times 2 = 16$

3. Attempt any eight parts.

(i)	Find δy and dy for $y = x^2 - 1$, when x changes from 3 to 3.02.	(ii)	Evaluate $\int \left(\sqrt{x} - \frac{1}{\sqrt{x}}\right)^2 dx$
(iii)	Evaluate $\int \frac{x^2}{4 + x^2} dx$	(iv)	Evaluate $\int x^2 \ell nx \, dx$
(v)	Evaluate $\int_{-1}^{1} (x^{\frac{1}{3}} + 1) dx$	(vi)	Find the area between the x – axis and the curve $y = 4x - x^2$
(vii)	Solve the differential equation $\frac{dy}{dx} = \frac{y}{x^2}$	(viii)	Find unit vector in the direction of $\underline{v} = 2\underline{i} - \underline{j}$
(ix)	Find vector whose magnitude is 4 and is parallel to $2\underline{i} - 3\underline{j} + 6\underline{k}$	(x)	Calculate the projection of $\underline{a} = \underline{i} - \underline{k}$ along $\underline{b} = \underline{j} + \underline{k}$
(xi)	Find a unit vector perpendicular to the plane containing $\underline{a}$ and $\underline{b}$, $\underline{a} = \underline{i} + \underline{j}$, $\underline{b} = \underline{i} - \underline{j}$	(xii)	Prove that $\underline{i} - 2\underline{j} + 3\underline{k}$, $-2\underline{i} + 3\underline{j} - 4\underline{k}$ and $\underline{i} - 3\underline{j} + 5\underline{k}$ are coplanar.

$9 \times 2 = 18$

4. Attempt any nine parts.

(i)	Show that the points $A(3, 1)$, $B(-2, -3)$ and $C(2, 2)$ are vertices of an isosceles triangle.
(ii)	Show that the points $A(-3, 6)$, $B(3, 2)$ and $C(6, 0)$ are collinear.
(iii)	Find an equation of the straight line if it is perpendicular to a line with slope -6 and its y – intercept is $\frac{4}{3}$.
(iv)	Write down an equation of the line which cuts the x – axis at $(2, 0)$ and y – axis at $(0, -4)$.
(v)	Transform the equation $5x - 12y + 39 = 0$ into two-intercept form.
(vi)	Check whether the lines $3x - 4y - 3 = 0$, $5x + 12y + 1 = 0$, $32x + 4y - 17 = 0$ are concurrent or not.
(vii)	Find the distance between the parallel lines $l_1 : 2x - 5y + 13 = 0$ and $l_2 : 2x - 5y + 6 = 0$
(viii)	Find the centre and radius of the circle with the equation $5x^2 + 5y^2 + 14x + 12y - 10 = 0$
(ix)	Find the co- ordinates of the points of intersection of the line $2x + y = 5$ and the circle $x^2 + y^2 + 2x - 9 = 0$
(x)	Write equations of the tangents to the circle $x^2 + y^2 - 4x + 6y + 9 = 0$ at the points on the circle whose ordinate is -2.
(xi)	Find an equation of the parabola whose focus is $F(-3, 4)$ and directrix is $3x - 4y + 5 = 0$
(xii)	Find an equation of the ellipse having centre at $(0, 0)$, focus at $(0, -3)$ and one vertex at $(0, 4)$.
(xiii)	Find an equation of hyperbola whose foci are $(\pm 4, 0)$ and vertices $(\pm 2, 0)$.

SECTION-II

$3 \times 10 = 30$

NOTE: Attempt any three questions.

5.(a)	Prove that $\lim_{x \to 0} \frac{a^x - 1}{x} = \log_e a$	(b)	Find by definition the derivative of $\cos\sqrt{x}$.
6.(a)	Evaluate $\int \frac{x\,dx}{x^4 + 2x^2 + 5}$	(b)	Find equations of two parallel lines perpendicular to $2x - y + 3 = 0$ such that product of x – and y – intercepts of each is 3.

7.(a)	Find the area bounded by the curve $y = x^3 - 4x$ and the x – axis.
(b)	Maximize $f(x, y) = x + 3y$ subject to constraints $2x + 5y \leq 30$, $5x + 4y \leq 20$, $x \geq 0$, $y \geq 0$
8.(a)	Show that $y = x^x$ has minimum value at $x = \frac{1}{e}$
(b)	Find the equation of the circle passing through the points $A(4, 5)$, $B(-4, -3)$, $C(8, -3)$
9.(a)	Find the focus, vertex and directrix of parabola $x^2 - 4x - 8y + 4 = 0$
(b)	Prove that by using vectors method $\cos(\alpha - \beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$