Paper Code Number: **4196**	2023 (1st-A) INTERMEDIATE PART-II (12th 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:	$x - 3y > 0$	$x - 3y > 0$	$x + y > 0$	$x < 0$
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		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	$\vec{u} \times (\vec{v}.\vec{w})$ is:	Scalar product	Vector product	Inner product	Meaningless
10	The value of $[\hat{i} \ \hat{j} \ \hat{k}]$	-1	0	1	2
11	$\displaystyle \lim_{x \to -\infty} (e^x) =$	$-\infty$	0	1	$+\infty$
12	$f(x) = \sin x$ is:	Odd function	Even function	Constant function	Linear function
13	If $y = x + \dfrac{1}{x}$, then $\dfrac{dy}{dx} =$	$1 - \dfrac{1}{x}$	$\dfrac{1}{x} - 1$	$1 - \dfrac{1}{x^2}$	$\dfrac{1}{x^2} - 1$
14	If $y = \sinh^{-1} x$, then $\dfrac{dy}{dx} =$	$\dfrac{1}{\sqrt{x^2+1}}$	$\dfrac{1}{\sqrt{x^2-1}}$	$\dfrac{-1}{\sqrt{x^2+1}}$	$\dfrac{-1}{\sqrt{x^2-1}}$
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	$\displaystyle \int_{\pi}^{\pi} \sin x \, dx =$	0	1	2	3
18	If $y = x^3$, then $dy =$	$3x^2$	$x^2 dx$	$3x^2 dx$	$3x\, dx$
19	$\displaystyle \int_a^b f(x)\,dx =$	$\displaystyle \int_b^a f(x)\,dx$	$\displaystyle -\int_b^a f(x)\,dx$	$\displaystyle \int_{-a}^{b} f(x)\,dx$	$\displaystyle -\int_{-a}^{-b} f(x)\,dx$
20	$\displaystyle \int \dfrac{f'(x)}{f(x)}\,dx =$	$\ln f(x) + c$	$\ln f'(x) + c$	$\ln f(x) f'(x) + c$	$\ln x + c$

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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   *M7N-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 $\lim\limits_{n \to \infty} \left(1 + \dfrac{3}{n}\right)^{2n}$	(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 $\quad x^{-3} + 2x^{-\frac{3}{2}} + 3$	(vi)	Find $\dfrac{dy}{dx}$ if $xy + y^2 = 2$
(vii)	Find $\dfrac{dy}{dx}$ if $x = y \sin y$	(viii)	Differentiate w.r.t. x $\quad x^2 \sec 4x$
(ix)	Find $\dfrac{dy}{dx}$ 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 $\int \left(\sqrt{x} - \dfrac{1}{\sqrt{x}}\right)^2 dx$
(iii)	Evaluate $\int \dfrac{x^2}{4 + x^2} dx$	(iv)	Evaluate $\int x^2 \ln x \, dx$
(v)	Evaluate $\int_{-1}^{1} (x^3 + 1) dx$	(vi)	Find the area between the x-axis and the curve $y = 4x - x^2$
(vii)	Solve the differential equation $\dfrac{dy}{dx} = \dfrac{y}{x^2}$	(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 $\dfrac{4}{3}$.
(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 $\lim\limits_{x \to 0} \dfrac{a^x - 1}{x} = \log_e a$	(b)	Find by definition the derivative of $\cos \sqrt{x}$.
6.(a)	Evaluate $\int \dfrac{x \, dx}{x^4 + 2x^2 + 5}$	(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 $2x + 5y \le 30$, $5x + 4y \le 20$, $x \ge 0$, $y \ge 0$		
8.(a)	Show that $y = x^x$ has minimum value at $x = \dfrac{1}{e}$		
(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 $\cos(\alpha - \beta) = \cos\alpha \cos\beta + \sin\alpha \sin\beta$		