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	$\vec{F} \times \vec{d}$	$\vec{F} \cdot \vec{d}$	$\vec{F} : \vec{d}$	$\vec{d} \times \vec{F}$
10	If $\vec{a}$ and $\vec{b}$ are non-zero vectors, then $\vec{a} \times \vec{b} =$	$\vec{b} \times \vec{a}$	$\vec{a} \cdot \vec{b}$	$\vec{b} \times \vec{a}$	$-\vec{b} \times \vec{a}$
11	$\lim_{x \to +\infty} (e^{-x}) =$	$-\infty$	0	1	$+\infty$
12	$f(x) = x$ 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	$1 + x + \frac{x^2}{\lfloor 2} + \frac{x^3}{\lfloor 3} + \ldots\ldots =$	$\sin x$	$\cos x$	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: MIN-251-23
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 × 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 × 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 × 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°. 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 × 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.		