Paper Code Number: **2191**	2023 (1^{st}-A) INTERMEDIATE PART-I (11^{th} Class)	Roll No: ____________

MATHEMATICS PAPER-I GROUP-I MTN-11-1-23

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	The set $\{1, -1\}$ possess closure property under:	Multiplication	Addition	Subtraction	Division
2	If 'p' is logic statement then $p \wedge \sim p$ is:	Tautology	Absurdity	Contingency	Conditional
3	Determinant of any unit matrix has value:	Greater than 1	Less than 1	1	Zero
4	If order of a matrix A is $m \times n$ and order of matrix B is $n \times p$ then order of matrix $(AB)^t$ is:	$m \times n$	$n \times m$	$m \times p$	$p \times m$
5	Reciprocal equation remain unchanged when 'X' is replaced by:	$-X$	$-\frac{1}{X}$	$\frac{1}{X^2}$	$\frac{1}{X}$
6	If ω is a cube root of unity then $1+\omega^{28}+\omega^{29}$ is equal to:	Zero	1	ω	ω^2
7	$\frac{x^2+1}{Q(x)}$ will be proper fraction if degree of $Q(x)$ is equal to:	0	1	2	3
8	$(n+1)th$ term of an A.P. is:	$a_1+(n-1)d$	$a_1-(n-1)d$	a_1+nd	a_1-nd
9	If A, G, H have their usual meaning, a and b are positive distinct real numbers and $G>0$ then:	A > G > H	A < G < H	H > G > A	G > H > A
10	In how many ways, 5 persons can be seated at a round table?	23	24	25	26
11	With usual notation $\frac{^nP_r}{r!}$ is equal to:	$^nC_{r-1}$	$^{n+1}C_r$	^nC_r	$^{n-1}C_r$
12	Number of terms in expansion of $(1+x)^{2n+1}$, 'n' is positive integer are:	$2n+2$	$2n+1$	$2n$	$3n+1$
13	In equality $n! > 2^n - 1$ is valid if:	$n<4$	$n \geq 4$	$n=3$	$n<3$
14	$\frac{\pi}{2}$ is an angle:	Acute	Obtuse	Quadrental	Non-quadrental
15	$\tan(\alpha - 90^o)$ is equal to:	$\cot\alpha$	$-\cot\alpha$	$\tan\alpha$	$-\tan\alpha$
16	Period of $3\sin 3x$ is:	$\frac{\pi}{3}$	$\frac{\pi}{2}$	$\frac{2\pi}{3}$	π
17	If α, β, γ are angles of an oblique triangle then it must be true that:	$\alpha = 90^o$	$\beta = 90^o$	$\gamma = 90^o$	No angle is 90^o
18	If ABC is right triangle then law of cosines reduces to:	Pythagoras theorem	Law of Sines	Area of triangle	Law of tangents
19	$y=\cos x$ is one to one function in interval:	$\left[0, \frac{2\pi}{3}\right]$	$[0, 2\pi]$	$[0, \infty]$	$[0, \pi]$
20	If $\cos 2x = 0$ then solution in first quadrant is:	30^o	45^o	60^o	15^o

INTERMEDIATE PART-I (11th Class)	2023 (1st-A)	Roll No:
MATHEMATICS PAPER-I 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.

MTN-11-1-23

SECTION-I

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

(i) Simplify as a simple complex number $(5,-4)\ (-3,-2)$

(ii) Express the complex number $1+i\sqrt{3}$ in polar form.

(iii) Write the descriptive and tabular form of $\{x \mid x \in N \wedge x+4=0\}$

(iv) For the sets $A=\{1,2,3,4,5\}$, $B=\{4,6,8,10\}$ verify the commutative property of intersection.

(v) Show that the statement $\sim(p \to q) \to p$ is a tautology.

(vi) If $A=\begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$, show that $A^4 = I_2$

(vii) Without expansion show that $\begin{vmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{vmatrix} = 0$

(viii) Find the value of λ if matrix $A=\begin{bmatrix} 4 & \lambda & 3 \\ 7 & 3 & 6 \\ 2 & 3 & 1 \end{bmatrix}$ is singular.

(ix) Solve $x^2-2x-899=0$ by completing square.

(x) Reduce $x^4-6x^2+10-\frac{6}{x^2}+\frac{1}{x^4}=0$ to quadratic form.

(xi) Discuss the nature of the roots of the equation $9x^2-12x+4=0$

(xii) Prove that the sum of cube roots of unity is zero.

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

(i) Resolve $\frac{7x+25}{(x+3)(x+4)}$ into partial fractions.

(ii) Find the number of terms in A.P if $a_1=3$, $d=7$ and $a_n=59$

(iii) Define a geometric progression (G.P).

(iv) If the numbers $\frac{1}{k}, \frac{1}{2k+1}$ and $\frac{1}{4k-1}$ are in harmonic sequence, find k.

(v) Find the sum of the infinite G.P, $2, \sqrt{2}, 1, \ldots\ldots$

(vi) How many terms of the series $-7+(-4)+(-1)+\ldots\ldots$ amount to 114?

(vii) How many 3 – digit numbers can be formed by using each one of the digits 2, 3, 5, 7, 9 only once?

(viii) Find the value of n, when ${}^nC_5 = {}^nC_4$

(ix) If sample space = $\{1, 2, 3, \ldots\ldots 9\}$, event $A=\{2,4,6,8\}$ and event $B=\{1,3,5\}$. Find $P(A \cup B)$

(x) Use mathematical induction to prove that the formula is true for $n=1$ and $n=2$ $1+4+7+\ldots\ldots+(3n-2)=\frac{n(3n-1)}{2}$

(xi) Calculate $(2.02)^4$ be means of binomial theorem.

(xii) If x is so small that its square and higher powers can be neglected, then show that $\frac{\sqrt{1+2x}}{\sqrt{1-x}} \approx 1+\frac{3}{2}x$

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

(i) What is the length of the arc intercepted on a circle of radius 14 cms by the arms of a central angle of $45°$?

(ii) Find the values of all the trigonometric functions of $420°$.

(iii) Prove that $2\cos^2\theta-1 = 1-2\sin^2\theta$

(iv) Prove that $\cos 330° \sin 600° + \cos 120° \sin 150° = -1$

(v) Prove that $\frac{\cos 11° + \sin 11°}{\cos 11° - \sin 11°} = \tan 56°$

(vi) Find the value of $\cos 15°$ without calculator.

(vii) Write the domain and range of cosecant function.

(viii) Find α if $a=7$, $b=7$, $c=9$.

(ix) With usual notations prove that $\Delta=\sqrt{s(s-a)(s-b)(s-c)}$

(x) Show that $r_3 = s\tan\frac{\gamma}{2}$

(xi) Prove that $\sin^{-1}x = \frac{\pi}{2} - \cos^{-1}x$

(xii) Find the solution set of $\sin x \cos x = \frac{\sqrt{3}}{4}$ in $[0, 2\pi]$

(xiii) Solve the following trigonometric equation $\cot^2\theta = \frac{1}{3}$ in $[0, 2\pi]$

SECTION-II

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

5.(a) Use matrices to solve the system of linear equations $x-2y+z=-1$, $3x+y-2z=4$, $y-z=1$

(b) Solve the equations simultaneously $x+y=a+b$; $\frac{a}{x}+\frac{b}{y}=2$

6.(a) Resolve into partial fractions $\frac{4x^3}{(x^2-1)(x+1)^2}$

(b) A die is thrown. Find the probability that the dots on the top are prime numbers or odd numbers.

7.(a) Find 'n' so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be harmonic mean between a and b.

(b) If 'x' is so small that its square and higher powers can be neglected, then show that $\frac{(9+7x)^{\frac{1}{2}}-(16+3x)^{\frac{1}{4}}}{4+5x} \approx \frac{1}{4}-\frac{17}{384}x$

8.(a) Find the values of other five trigonometric functions of θ, if $\cos\theta=\frac{12}{13}$ and the terminal side of the angle is not in the first quadrant.

(b) Show that $\frac{\tan\alpha+\tan\beta}{\tan\alpha-\tan\beta} = \frac{\sin(\alpha+\beta)}{\sin(\alpha-\beta)}$

9.(a) Prove that $(r_1+r_2)\tan\frac{\gamma}{2}=c$

(b) Prove that identity $\tan^{-1}\frac{1}{11}+\tan^{-1}\frac{5}{6}=\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{2}$

Paper Code Number: 2198	2023 (1^{st}-A) INTERMEDIATE PART-I (11^{th} Class)	Roll No: MTN-11-2-23
MATHEMATICS PAPER-I	**GROUP-II**	
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	If A is a matrix of order 3×1 then order of AA^t = ______	1×1	1×3	3×1	3×3
2	If $b^2-4ac<0$ for a quadratic equation $ax^2+bx+c=0$ then nature of the roots is ______.	Real and unequal	Real and repeated	Complex or imaginary	Real and rational
3	Under what condition one root of $x^2+px+q=0$ is additive inverse of other.	$p=0$	$q=0$	$p=1$	$q=1$
4	Partial fractions of $\dfrac{1}{(x-1)^2(x+1)}$ are of the type :	$\dfrac{Ax+B}{(x-1)^2}+\dfrac{c}{x+1}$	$\dfrac{A}{x-1}+\dfrac{B}{x+1}$	$\dfrac{Ax}{(x-1)^2}+\dfrac{B}{x-1}$	$\dfrac{A}{x-1}+\dfrac{B}{(x-1)^2}+\dfrac{C}{x+1}$
5	Fifth term of geometric progression(G.P) 3, 6, 12, ... is:	24	48	18	30
6	Sum of n term of the series $\sum_{k=1}^{n}k^2$ is:	$\dfrac{n(n+1)}{2}$	$\left[\dfrac{n(n+1)}{2}\right]^2$	$\dfrac{n(n+1)(2n+1)}{6}$	$\left[\dfrac{n(2n+1)}{2}\right]^2$
7	If ${}^nC_{10}=\dfrac{12\times 11}{2!}$ then n = ____	12	8	11	13
8	If A and B are two independent events then $P(A\cap B)$ = ____	$P(A)+P(B)$	$P(A)P(B)$	$P(A)-P(B)$	$P(A)+P(B)-P(A\cup B)$
9	The sum of coefficients in the binomial expansion equals to ____	2^{n-1}	2^{n+1}	2^{2n-1}	2^n
10	Third term in the expansion of $(1+2x)^{-1}$ is:	$2x$	$-2x$	$4x^2$	$-8x^3$
11	The radius r of the circle in which the arm of a central angle of measure 1 radian cut off an arc of length 35cm is ______.	35 cm	36 cm	30 cm	32 cm
12	$3\sin\alpha - 4\sin^3\alpha$ = ______	$\cos 3\alpha$	$\sin 3\alpha$	$\cos 2\alpha$	$\sin 2\alpha$
13	The range of the function $y=\sec x$ is:	$-1\le y\le 1$	$-\infty<y<+\infty$	$y\le 1$	$y\ge 1$ or $y\le -1$
14	If measures of the sides of the triangle ABC are $a=13$, $b=14$, $c=15$ then r = ____	8.125	10.5	4	14
15	With usual notations the circum-radius R = ________	$\dfrac{abc}{4\Delta}$	$\dfrac{4\Delta}{abc}$	$\dfrac{\Delta}{s}$	$\dfrac{s}{\Delta}$
16	$\sin^{-1}A+\sin^{-1}B$ = ______	$\sin^{-1}\left(A\sqrt{1+B^2}+B\sqrt{1+A^2}\right)$	$\sin^{-1}\left(A\sqrt{1-B^2}+B\sqrt{1-A^2}\right)$	$\sin^{-1}\left(A\sqrt{1+B^2}-B\sqrt{1+A^2}\right)$	$\sin^{-1}\left(A\sqrt{1-B^2}-B\sqrt{1-A^2}\right)$
17	Solutions of the equation $\sin x=-\sqrt{3}/2$ which lie in $[0,2\pi]$ are:	$\pi/6,\ 5\pi/6$	$2\pi/3,\ 4\pi/3$	$4\pi/3,\ 5\pi/3$	$\pi/3,\ 4\pi/3$
18	If $x+iy=r\cos\theta+ir\sin\theta$ be the polar form of complex number then angle θ = ______	$\tan^{-1}\dfrac{y}{x}$	$\tan\dfrac{y}{x}$	$\tan\dfrac{x}{y}$	$\tan^{-1}\dfrac{x}{y}$
19	A compound statement of the form if p then q is called:	Conjunction	Disjunction	Conditional	biconditional
20	In a square matrix A all elements below the principal diagonal are zero is called:	Lower triangular matrix	Upper triangular matrix	Symmetric matrix	Singular matrix

INTERMEDIATE PART-I (11th Class)	2023 (1st-A)	Roll No: MTN-11-2-23
MATHEMATICS PAPER-I 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

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

(i) State trichotomy property and transitive property of inequalities of real numbers.

(ii) Separate $\frac{i}{1+i}$ into real and imaginary parts.

(iii) Define Overlapping sets.

(iv) Construct truth table for statement $(p \wedge \sim p) \to q$

(v) Define semi-group.

(vi) If $A = \begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$, show that $A^4 = I_2$

(vii) Write two properties of determinants.

(viii) Define Skew Hermitian Matrix.

(ix) Solve the equation $x^{\frac{1}{2}} - x^{\frac{1}{4}} - 6 = 0$

(x) Evaluate $(1 + \omega - \omega^2)^8$

(xi) Use factor theorem to determine if $x - 2$ is a factor of $x^3 + x^2 - 7x + 1$

(xii) If α and β are the roots of $3x^2 - 2x + 4 = 0$ find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

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

(i) Define Proper Rational Fraction.

(ii) Which term of the A.P $5, 2, -1, \ldots\ldots$ is -85?

(iii) If $5, 8$ are two A.Ms between a and b, find a and b.

(iv) Sum the series $3 + 5 - 7 + 9 + 11 - 13 + 15 + 17 - 19 + \ldots\ldots\ldots$ to $3n$ terms.

(v) If A, G and H are arithmetic, geometric and harmonic means between a and b respectively, show that $G^2 = AH$

(vi) Find the sum of n terms of the series whose nth term is $n^2 + 4n + 1$.

(vii) Prove from the first principle that ${}^nP_r = n \cdot {}^{n-1}P_{r-1}$

(viii) How many permutations of the letters of the word PANAMA can be made, if P is to be the first letter in each arrangement?

(ix) If ${}^nC_8 = {}^nC_{12}$, find n.

(x) Use mathematical induction to prove $2 + 4 + 6 + \ldots\ldots\ldots + 2n = n(n+1)$ for $n = 1, 2$

(xi) Expand by using binomial theorem $(a + 2b)^5$

(xii) Expand $(1 - x)^{\frac{1}{2}}$ up to three terms.

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

(i) Find x, if $\tan^2 45^\circ - \cos^2 60^\circ = x \sin 45^\circ \cos 45^\circ \tan 60^\circ$

(ii) Prove that $\sec^2 A + \operatorname{cosec}^2 A = \sec^2 A \operatorname{cosec}^2 A$

(iii) Prove that $\frac{1}{1+\sin\theta} + \frac{1}{1-\sin\theta} = 2\sec^2\theta$

(iv) If α, β, γ are the angles of a triangle ABC, then prove that $\tan(\alpha + \beta) + \tan\gamma = 0$

(v) Prove that $\sin(45^\circ + \alpha) = \frac{1}{\sqrt{2}}(\sin\alpha + \cos\alpha)$

(vi) Prove the identity $\frac{1 - \cos\alpha}{\sin\alpha} = \tan\frac{\alpha}{2}$

(vii) Find the period of $\cot 8x$

(viii) Find the area of triangle ABC, given three sides, $a = 18, b = 24, c = 30$

(ix) Prove that $r_1 r_2 r_3 = rs^2$

(x) A plane flying directly above a post of 6000m away from anti-aircraft gun observes the gun at an angle of depression of 27°. Find the height of the plane.

(xi) Find the value of $\cos\left(\sin^{-1}\frac{1}{\sqrt{2}}\right)$

(xii) Find the solutions of the equation $\cot\theta = \frac{1}{\sqrt{3}}$, θ lie in $[0, 2\pi]$

(xiii) Find the values of θ, $2\sin\theta + \cos^2\theta - 1 = 0$

SECTION-II

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

5.(a) Find the multiplicative inverse of $A = \begin{bmatrix} 1 & 2 & -1 \\ 0 & -1 & 3 \\ 1 & 0 & 2 \end{bmatrix}$

(b) Find the values of a and b if -2 and 2 are the roots of polynomial $x^3 - 4x^2 + ax + b$

6.(a) Resolve into partial fractions $\frac{x^2 + 1}{x^3 + 1}$

(b) There are twenty chits marked $1, 2, 3, \ldots\ldots\ldots, 20$ in a bag. Find the probability of picking a chit, the number written on which is a multiple of 4 or a multiple of 7.

7.(a) Find n A.M's between a and b.

(b) Use mathematical induction to prove that $1 + 2 + 4 + \ldots.. + 2^{n-1} = 2^n - 1$

8.(a) Prove the identity $\sin^6\theta + \cos^6\theta = 1 - 3\sin^2\theta\cos^2\theta$

(b) If $\alpha + \beta + \gamma = 180^\circ$ prove that $\cot\beta\cot\alpha + \cot\beta\cot\gamma + \cot\alpha\cot\gamma = 1$

9.(a) Prove that $r_1 + r_2 + r_3 - r = 4R$

(b) Prove that $\sin^{-1}\frac{77}{85} - \sin^{-1}\frac{3}{5} = \cos^{-1}\frac{15}{17}$