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 (11^{th} Class) | 2023 (1^{st}-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.

SECTION-I

MTN-11-1-23

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 $\{x | x \in N \wedge x + 4 = 0\}$

(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 $\sim (p \rightarrow q) \rightarrow p$ 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, $2, \sqrt{2}, 1, \ldots\ldots\ldots$

(vi) How many terms of the series $-7 + (-4) + (-1) + \ldots\ldots\ldots$ 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 $n = 2$ $1 + 4 + 7 + \ldots\ldots\ldots + (3n - 2) = \frac{n(3n-1)}{2}$

(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 $\tan^{-1}\frac{1}{11} + \tan^{-1}\frac{5}{6} = \tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{2}$