Paper Code Number: 2198	2023 (1st-A) INTERMEDIATE PART-I (11th 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 $AA' =$ _____	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 $\frac{1}{(x-1)^2(x+1)}$ are of the type :	$\frac{Ax+B}{(x-1)^2} + \frac{c}{x+1}$	$\frac{A}{x-1} + \frac{B}{x+1}$	$\frac{Ax}{(x-1)^2} + \frac{B}{x-1}$	$\frac{A}{x-1} + \frac{B}{(x-1)^2} + \frac{C}{x+1}$
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:	$\frac{n(n+1)}{2}$	$\left[\frac{n(n+1)}{2}\right]^2$	$\frac{n(n+1)(2n+1)}{6}$	$\left[\frac{n(2n+1)}{2}\right]^2$
7	If ${}^nC_{10} = \frac{12 \times 11}{2!}$ 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	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 a triangle ABC are $a = 13$, $b = 14$, $c = 15$ then $r =$ _____	8.125	10.5	4	14
15	With usual notations the circum-radius $R =$ _____	$\frac{abc}{4\Delta}$	$\frac{4\Delta}{abc}$	$\frac{\Delta}{s}$	$\frac{s}{\Delta}$
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 $\sin x = -\frac{\sqrt{3}}{2}$ 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 $\theta =$ _____	$\tan^{-1}\frac{y}{x}$	$\tan\frac{y}{x}$	$\tan\frac{x}{y}$	$\tan^{-1}\frac{x}{y}$
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 × 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 $(p \wedge \sim p) \rightarrow q$	(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 × 2 = 16**

(i)	Define Proper Rational Fraction.
(ii)	Which term of the A.P 5, 2, −1, ... is −85 ?
(iii)	If 5, 8 are two A.Ms between a and b, find a and b.
(iv)	Sum the series $3 + 5 - 7 + 9 + 11 - 13 + 15 + 17 - 19 +$..... 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 $2 + 4 + 6 +$ ..... $+ 2n = n(n+1)$ 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 × 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 × 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, ..., 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 $1 + 2 + 4 + ...+ 2^{n-1} = 2^n - 1$		
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 $\sin^{-1}\frac{77}{85} - \sin^{-1}\frac{3}{5} = \cos^{-1}\frac{15}{17}$