Paper Code Number:	2197

2021 (A) Roll No: ________________

INTERMEDIATE PART-I (11^{th} CLASS)

MTN-G1-21

MATHEMATICS PAPER-I **GROUP-I** **OBJECTIVE**

TIME ALLOWED: 30 Minutes
MAXIMUM MARKS: 20

Note: 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. No credit will be awarded in case BUBBLES are not filled. Do not solve question on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) The product of roots of the equation $3x^2 + 5x = 0$
(A) $\frac{-5}{3}$ (B) $\frac{5}{3}$ (C) 5 (D) 0

(2) An equation which is true for all values of unknown is called:
(A) Identity (B) Algebric equation (C) Algebric relation (D) Conditional equation

(3) The A.M between $1 - x + x^2$ and $1 + x + x^2$ is: (A) $x + 1$ (B) $x^2 + 1$ (C) $\frac{x+1}{2}$ (D) $\frac{x^2+1}{2}$

(4) G.M between 2 and 8 is/are: (A) 5 (B) 8 (C) ± 4 (D) 16

(5) The sum of an infinite geometric series with $|r| < 1$, where first term is a and r is common ratio:
(A) $\frac{a}{1+r}$ (B) $\frac{a}{1-r^2}$ (C) $\frac{a}{1-r}$ (D) $\frac{a}{1+r^2}$

(6) If ${}^nP_2 = 30$, then $n =$ (A) 6 (B) 4 (C) 5 (D) 8

(7) General term in the expansion of $(a + x)^n$ is:
(A) $\binom{n}{r} a^{n-r} x^r$ (B) $\binom{n}{r} a^r x^n$ (C) $\binom{n}{r} a^n x^{n-r}$ (D) $\binom{n}{r} a^n x^n$

(8) $\frac{5\pi}{4}$ radian = (A) 360^o (B) 225^o (C) 335^o (D) 270^o

(9) $(\cos 2\theta)^2 + (\sin 2\theta)^2 =$ (A) 0 (B) 2 (C) 4 (D) 1

(10) $\sin(180^0 + \alpha) =$ (A) $-\cos\alpha$ (B) $\sin\alpha$ (C) $\cos\alpha$ (D) $-\sin\alpha$

(11) Period of $\tan\frac{x}{3}$ is: (A) π (B) $\frac{\pi}{2}$ (C) $\frac{\pi}{3}$ (D) 3π

(12) In any triangle ABC, with usual notation, $r_1 =$
(A) $\frac{\Delta}{s-a}$ (B) $\frac{\Delta}{s-b}$ (C) $\frac{\Delta}{s-c}$ (D) $\frac{\Delta}{s}$

(13) Circum radius $R =$
(A) $\frac{\Delta}{abc}$ (B) $\frac{\Delta}{s}$ (C) $\frac{abc}{4\Delta}$ (D) $\frac{\Delta}{s-a}$

(14) $\cos\left(\sin^{-1}\frac{1}{\sqrt{2}}\right) =$ (A) $\frac{1}{\sqrt{2}}$ (B) $\frac{1}{2}$ (C) $\frac{\pi}{4}$ (D) $-\frac{\pi}{4}$

(15) If $\sin x = \frac{\sqrt{3}}{2}$ and $x \in [0, 2\pi]$ then $x =$
(A) $\frac{5\pi}{3}, \frac{4\pi}{3}$ (B) $\frac{\pi}{4}, \frac{3\pi}{4}$ (C) $\frac{\pi}{3}, \frac{2\pi}{3}$ (D) $\frac{\pi}{6}, \frac{5\pi}{6}$

(16) If A and B are non empty disjoint sets then:
(A) $A \cap B = A$ (B) $A \cap B = B$ (C) $A \cap B = \phi$ (D) $A \cap B \neq \phi$

(17) If $z = -2 + 3i$, then $\bar{z} =$
(A) $-2 - 3i$ (B) $2 - 3i$ (C) $-2 + 3i$ (D) $2 + 3i$

(18) If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, then Adj $A =$
(A) $\begin{bmatrix} -a & -b \\ c & d \end{bmatrix}$ (B) $\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ (C) $\begin{bmatrix} a & -b \\ -c & d \end{bmatrix}$ (D) $\begin{bmatrix} -a & -b \\ c & -d \end{bmatrix}$

(19) If $|A| = 5$ then $|A^t| =$ (A) $\frac{1}{5}$ (B) 0 (C) -5 (D) 5

(20) Sum of all the four fourth roots of unity is: (A) 0 (B) 1 (C) -1 (D) 4

2021 (A) Roll No: ______________

INTERMEDIATE PART-I (11th CLASS)

MATHEMATICS PAPER-I MTN-G1-21 TIME ALLOWED: 2.30 Hours

GROUP-I **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

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

(i) Find the modulus of the complex number $1 - i\sqrt{3}$

(ii) Simplify $(2, 6) \div (3, 7)$

(iii) Name the property used in the following equation $a(b-c) = ab - ac$

(iv) Write two proper subsets of the set $\{a, b, c\}$

(v) Construct the truth table of the following statement $(p \wedge \sim p) \rightarrow q$

(vi) Find the solution of the linear equation $xa = b$, where a and b belong to group G.

(vii) Find x and y if $\begin{bmatrix} 2 & 0 & x \\ 1 & y & 3 \end{bmatrix} + 2\begin{bmatrix} 1 & x & y \\ 0 & 2 & -1 \end{bmatrix} = \begin{bmatrix} 4 & -2 & 3 \\ 1 & 6 & 1 \end{bmatrix}$

(viii) Without expansion verify $\begin{vmatrix} 1 & a^2 & \frac{a}{bc} \\ 1 & b^2 & \frac{b}{ca} \\ 1 & c^2 & \frac{c}{ab} \end{vmatrix} = 0$

(ix) Solve the equation by using the quadratic formula $16x^2 + 8x + 1 = 0$

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

(xi) Find the inverse of matrix $\begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$

(xii) If α, β are roots of the equation $x^2 - px - p - c = 0$ then prove that $(1+\alpha)(1+\beta) = 1 - c$

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

(i) Resolve $\frac{1}{(x+1)^2(x^2-1)}$ into partial fractions without finding the constants.

(ii) Resolve $\frac{4x^2}{(x^2+1)^2(x-1)}$ into partial fractions without finding constants.

(iii) If $a_{n-3} = 2n - 5$ find the *nth* term of the sequence.

(iv) Find A.M. between $x - 3$ and $x + 5$

(v) If 5 is harmonic mean between 2 and b, Find b.

(vi) Find the 12^{th} term of the harmonic sequence $\frac{1}{3}, \frac{2}{9}, \frac{1}{6}, -----$

(vii) Find the value of n if ${}^{n}p_4 : {}^{n-1}p_3 = 9:1$

(viii) How many necklaces can be made by 6 beads of different colours?

(ix) How many diagonals can be made by 8 sided figure?

(x) Verify the statement $2 + 6 + 18 + ----- + 2 \times 3^{n-1} = 3^n - 1$ for $n = 1, 2$

(xi) Expand $(4 - 3x)^{\frac{1}{2}}$ upto 3 terms.

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

MTN-G1-21

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

(i) Find r, when $\ell = 5\,cm$, $\theta = \frac{1}{2}$ radian.

(ii) Write any two fundamental identities of trigonometry.

(iii) Evaluate $\dfrac{1 - \tan^2 \pi/3}{1 + \tan^2 \pi/3}$

(iv) If α, β, γ are angles of triangle ABC then prove that $\cos(\alpha + \beta) = -\cos\gamma$

(v) Prove that $\tan(45^o + A)\tan(45^o - A) = 1$

(vi) Prove that $\dfrac{\sin 8x + \sin 2x}{\cos 8x + \cos 2x} = \tan 5x$

(vii) Find the period of $\sin\frac{x}{5}$

(viii) A kite is flying at a height of $67.2m$ is attached to a fully stretched string inclined at an angle of 55^o to the horizontal. Find the length of string.

(ix) Find the area of triangle ABC, when $b = 37$, $c = 45$, $\alpha = 30^o 50'$

(x) Prove that $r r_1 r_2 r_3 = \Delta^2$

(xi) Show that $\tan(\sin^{-1} x) = \dfrac{x}{\sqrt{1-x^2}}$

(xii) Solve the equation $\sin x = \frac{1}{2}$, where $x \in [0, 2\pi]$

(xiii) Find solution of the equation $\sec x = -2$ which lies in the interval $[0, 2\pi]$

SECTION-II

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

5.(a) If $A = \begin{bmatrix} -1 & 2 \\ 1 & 4 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 3 \\ -2 & 1 \end{bmatrix}$ then verify $(AB)^t = B^t A^t$

(b) If 'ω' is a root of $x^2 + x + 1 = 0$ show that its other root is ω^2 and prove that $\omega^3 = 1$

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

(b) Find four Arithmetic Means (A.Ms) between $\sqrt{2}$ and $\dfrac{12}{\sqrt{2}}$

7.(a) Find the values of n and r, when ${}^nC_r = 35$ and ${}^nP_r = 210$

(b) Find the coefficient of x^5 in the expansion of $\left(x^2 - \dfrac{3}{2x}\right)^{10}$

8.(a) Prove that $\sin^6\theta - \cos^6\theta = (\sin^2\theta - \cos^2\theta)(1 - \sin^2\theta\cos^2\theta)$

(b) Prove that $\dfrac{2\sin\theta\,\sin(2\theta)}{\cos\theta + \cos(3\theta)} = \tan(2\theta)\tan\theta$

9.(a) The sides of a triangle are $x^2 + x + 1$, $2x + 1$ and $x^2 - 1$. Prove that the greatest angle of the triangle is 120^o.

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

Paper Code Number:	2194

2021 (A) Roll No: ______________

INTERMEDIATE PART-I (11^{th} CLASS)

MATHEMATICS PAPER-I MTN-G2-21 TIME ALLOWED: 30 Minutes

GROUP-II **OBJECTIVE** MAXIMUM MARKS: 20

Note: 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. No credit will be awarded in case BUBBLES are not filled. Do not solve question on this sheet of OBJECTIVE PAPER.

Q.No.1

(1) The A.M between $\sqrt{2},\ 3\sqrt{2}$ is: (A) $\sqrt{6}$ (B) $-2\sqrt{2}$ (C) $2\sqrt{2}$ (D) $-\sqrt{6}$

(2) Common ratio of G.P $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ is:
(A) $\pm\sqrt{\frac{a}{c}}$ (B) $\pm\sqrt{\frac{c}{a}}$ (C) $\pm\sqrt{\frac{b}{c}}$ (D) $\pm\sqrt{\frac{c}{b}}$

(3) H.M between 3 and 7 is: (A) 5 (B) $\sqrt{21}$ (C) $\frac{21}{5}$ (D) $\frac{5}{21}$

(4) If A and B are two independent events, then $P(A\cap B) =$
(A) $P(A)+P(B)$ (B) $P(A)-P(B)$ (C) $P(A\cup B)$ (D) $P(A)\cdot P(B)$

(5) The number of terms in the expansion of $(a+x)^n$ are:
(A) n (B) $n+1$ (C) $n-1$ (D) $2n$

(6) The value of $\tan\theta$ for $\theta = 30^o$ is: (A) $\sqrt{3}$ (B) $\frac{1}{\sqrt{3}}$ (C) $\frac{2}{\sqrt{3}}$ (D) $\frac{\sqrt{3}}{2}$

(7) $\frac{5\pi}{6}$ radian = (A) 150^o (B) 130^o (C) 120^o (D) 60^o

(8) If $\sin\alpha = \frac{4}{5},\ 0<\alpha<\frac{\pi}{2}$, then $\cos\alpha =$ (A) $\frac{2}{5}$ (B) $\frac{1}{5}$ (C) $\frac{4}{5}$ (D) $\frac{3}{5}$

(9) π is the period of: (A) $\sec\theta$ (B) $\operatorname{cosec}\theta$ (C) $\cot\theta$ (D) $\sin 3\theta$

(10) In any triangle ABC, with usual notation $\sqrt{\frac{s(s-c)}{ab}} =$
(A) $\cos\frac{\gamma}{2}$ (B) $\cos\frac{\alpha}{2}$ (C) $\cos\frac{\beta}{2}$ (D) $\sin\frac{\alpha}{2}$

(11) Radius of e-circle opposite to vertex 'A' of ΔABC is:
(A) $\frac{\Delta}{s-a}$ (B) $\frac{\Delta}{s-c}$ (C) $\frac{\Delta}{s}$ (D) $\frac{\Delta}{s-b}$

(12) $2\tan^{-1}(A) =$
(A) $\tan^{-1}\left(\frac{A}{1-A^2}\right)$ (B) $\tan^{-1}\left(\frac{A}{1+A^2}\right)$ (C) $\tan^{-1}\left(\frac{2A}{1-A^2}\right)$ (D) $\tan^{-1}\left(\frac{2A}{1+A^2}\right)$

(13) Reference angle of $\sin x = \frac{1}{2}$ is: (A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{4}$ (D) $\frac{\pi}{2}$

(14) Every non terminating, non recurring decimal represents:
(A) Rational number (B) Irrational number (C) Natural number (D) Whole number

(15) If A and B are any subsets of U, then $A-B =$
(A) $A\cup B^C$ (B) $(A\cup B)^C$ (C) $(A\cap B)^C$ (D) $A\cap B^C$

(16) A square matrix $A=[a_{ij}]$ is called upper triangular matrix if:
(A) $a_{ij}=0$ for $i<j$ (B) $a_{ij}=0$ for $i>j$ (C) $a_{ij}\neq 0$ for $i>j$ (D) $a_{ij}=k$ for $i<j$

(17) The trivial solution of system of homogeneous linear equation in three variables is:
(A) $(0,0,1)$ (B) $(0,1,0)$ (C) $(0,0,0)$ (D) $(0,-1,0)$

(18) If $\alpha,\ \beta$ are the roots of $x^2-px-p-c=0$, then $\alpha\beta =$
(A) $-p-c$ (B) $p+c$ (C) $p-c$ (D) $-p+c$

(19) Sum of all the four fourth roots of unity is: (A) 1 (B) 0 (C) -1 (D) 2

(20) Partial fraction of $\frac{x^2+1}{(x+1)(x-1)}$ will be of the form:
(A) $\frac{A}{x-1}+\frac{B}{x+1}$ (B) $\frac{A}{x+1}+\frac{Bx+C}{x-1}$ (C) $\frac{Ax+B}{x^2-1}$ (D) $1+\frac{A}{x+1}+\frac{B}{x-1}$

2021 (A) Roll No: ______________

INTERMEDIATE PART-I (11th CLASS)

MATHEMATICS PAPER-I MTN-G2-21 TIME ALLOWED: 2.30 Hours

GROUP-II **SUBJECTIVE** MAXIMUM MARKS: 80

NOTE: Write same question number and its part number on answer book, as given in the question paper.

SECTION-I

2. Attempt any eight parts. **8 × 2 = 16**

(i) Prove the following rule of addition $\frac{a}{c}+\frac{b}{c}=\frac{a+b}{c}$

(ii) Find the multiplicative inverse of $(-4, 7)$

(iii) If Z_1 and Z_2 are the complex numbers then prove that $|Z_1 \cdot Z_2| = |Z_1| \cdot |Z_2|$

(iv) Write the set $\{x \mid x \in N \wedge x \leq 10\}$ into (i) Descriptive form (ii) Tabular form

(v) Determine that $p \rightarrow (p \vee q)$ is a tautology or not.

(vi) Find the domain and range of the relation $\{(x, y) | x + y > 5\}$ if $A = \{1, 2, 3, 4\}$

(vii) Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$

(viii) If A and B are two square matrices of same order, then explain why in general $(A+B)(A-B) \neq A^2 - B^2$

(ix) Without expansion, show that $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = 0$

(x) Find four fourth roots of unity.

(xi) Find the number, if sum of a positive number and its reciprocal is $\frac{26}{5}$

(xii) Discuss the nature of the roots of the equation $2x^2 + 5x - 1 = 0$

3. Attempt any eight parts. **8 × 2 = 16**

(i) Resolve into partial fractions $\frac{1}{(x-1)(2x-1)(3x-1)}$

(ii) Resolve into partial fractions, without finding the constants $\frac{x^2+15}{(x^2+2x+5)(x-1)}$

(iii) If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in A.P, show that $b = \frac{2ac}{a+c}$

(iv) How many terms of the series $-7 + (-5) + (-3) + ---$, amount to 65?

(v) Find geometric means between 2 and 16.

(vi) If $y = \frac{x}{2} + \frac{1}{4}x^2 + \frac{1}{8}x^3 + ---$ and if $0 < x < 2$, prove that $x = \frac{2y}{1+y}$

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

(viii) How many arrangements of the letters of word, taken all together, can be made "PAKISTAN"?

(ix) What is the probability that a slip of numbers divisible by 4 are picked from the slips bearing numbers 1, 2, 3, ---, 10?

(x) Show that the inequality $4^n > 3^n + 4$ is true for integral values of $n = 2, 3$

(xi) Expand upto three terms $(4-3x)^{1/2}$

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

P.T.O.

MTN-G2-21

4. Attempt any nine parts. **9 × 2 = 18**

(i) If $\sin\theta = -\frac{1}{\sqrt{2}}$ R(θ) is in 3rd quadrant. Find the value of $\cot\theta$

(ii) Verify that $2\sin 45^o + \frac{1}{2}\operatorname{cosec}45^o = \frac{3}{\sqrt{2}}$

(iii) Verify that $(\sec\theta + \tan\theta)(\sec\theta - \tan\theta) = 1$

(iv) Express $\sin 319^o$ as a trigonometric function of an angle of positive degree measure of less than 45^o.

(v) Prove that $\tan(45^o + A).Tan(45^o - A) = 1$

(vi) Prove that $1 + \tan\alpha . \tan 2\alpha = \sec 2\alpha$

(vii) Find the period of $3\cos\frac{x}{5}$

(viii) Solve for C in a triangle ΔABC if $\gamma = 90^o$, $\alpha = 62^o40'$ and $b = 796$

(ix) In an equilateral triangle find the value of R.

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

(xi) Find the value of $\operatorname{cosec}(\tan^{-1}(-1))$

(xii) Solve $\sin x + \cos x = 0$ for $x \in [0, 2\pi]$

(xiii) Find the solution of $\cot\theta = \frac{1}{\sqrt{3}}$ for $\theta \in [0, \pi]$

SECTION-II

NOTE: Attempt any three questions. **3 × 10 = 30**

5.(a) Solve the system of linear equations by Cramer's rule.
$2x_1 - x_2 + x_3 = 8,\quad x_1 + 2x_2 + 2x_3 = 6,\quad x_1 - 2x_2 - x_3 = 1$

(b) If the roots of $px^2 + qx + q = 0$ are α and β, then prove that $\sqrt{\frac{\alpha}{\beta}} + \sqrt{\frac{\beta}{\alpha}} + \sqrt{\frac{q}{p}} = 0$

6.(a) Resolve $\frac{3x + 7}{(x^2 + 4)(x + 3)}$ into partial fractions.

(b) Sum of three numbers in A.P. is 24 and their product is 440. Find the numbers.

7.(a) If $y = \frac{1}{3} + \frac{1\cdot 3}{2!}\left(\frac{1}{3}\right)^2 + \frac{1\cdot 3\cdot 5}{3!}\left(\frac{1}{3}\right)^3 + ------$ then prove that $y^2 + 2y - 2 = 0$

(b) Find the values of n and r when ${}^nC_r = 35$ and ${}^nP_r = 210$

8.(a) Find the values of the trigonometric function $\frac{-17\pi}{3}$

(b) Prove that $\frac{2\sin\theta\sin 2\theta}{\cos\theta + \cos 3\theta} = \tan 2\theta\tan\theta$

9.(a) Solve the triangle ABC if $a = 53$; $\beta = 88^o36'$; $\gamma = 31^o54'$

(b) Prove that $\sin^{-1}\left(\frac{5}{13}\right) + \sin^{-1}\left(\frac{7}{25}\right) = \cos^{-1}\left(\frac{253}{325}\right)$

15-2021(A)-12000 **(MULTAN)**