Roll No _____ (To be filled in by the candidate)

MATHEMATICS **(Academic Sessions 2020 – 2022 to 2023 – 2025)**

Q.PAPER – I (Objective Type) 224-1st Annual-(INTER PART – I) Time Allowed : 30 Minutes

GROUP – I Maximum Marks : 20

PAPER CODE = 6195

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	Rank of the matrix $\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ is :			
	(A) 0	(B) 1 ●	(C) 2	(D) 3
2	The fraction $\frac{x+1}{x^2+2}$ is :			
	(A) Improper fraction	(B) Proper fraction ●	(C) Identity	(D) Mixed
3	The multiplicative inverse of (1 , 0) is :			
	(A) (1 , 0) ●	(B) (0 , 1)	(C) (– 1 , 0)	(D) (0 , – 1)
4	The roots of $2x^2 - 7x + 3 = 0$, are :			
	(A) Equal	(B) Complex	(C) Irrational	(D) Rational ●
5	The value of $(-i)^9$ is :			
	(A) – 1	(B) 1	(C) i	(D) – i ●
6	If A is a square matrix of order 3 and $\lvert A \rvert = 2$, then $\lvert 2A \rvert$ = :			
	(A) 16 ●	(B) 8	(C) 6	(D) 2
7	The number of elements of the power set of A = { a, { b , c } } are :			
	(A) 2	(B) 4 ●	(C) 6	(D) 8
8	If $A \subseteq B$, then :			
	(A) $A \cup B = A$	(B) $A \cap B = B$	(C) $B \cup A = A$	(D) $A \cup B = B$ ●
9	If ω is a cube root of unity, then value of $(1+\omega-\omega^2)^3$ is :			
	(A) 8ω	(B) $8\omega^2$	(C) – 8 ●	(D) 8
10	The converse of $\sim p \rightarrow q$ is :			
	(A) $p \rightarrow q$	(B) $p \rightarrow \sim q$	(C) $\sim q \rightarrow p$	(D) $q \rightarrow \sim p$ ●
11	$\cos 2\theta$ =:			
	(A) $1 - \sin^2\theta$	(B) $1 - 2\sin\theta$	(C) ● $1 - 2\sin^2\theta$	(D) $2\sin^2\theta - 1$
12	The G.M. between $\frac{1}{a}$ and $\frac{1}{b}$ is :			
	(A) $\pm\sqrt{ab}$	(B) $\pm\frac{1}{ab}$	(C) $\pm\sqrt{\frac{1}{ab}}$ ●	(D) ab

1-13	If $\cos x = -\frac{\sqrt{3}}{2}$, then the reference angle is : (A) $\frac{\pi}{3}$ (B) $\frac{\pi}{6}$ ● (C) $-\frac{\pi}{3}$ (D) $-\frac{\pi}{6}$
14	If $\sin\theta < 0$ and $\cot\theta > 0$, then θ lies in quadrant : (A) IV (B) III ● (C) II (D) I
15	The value of $\sin^{-1}(\cos\frac{\pi}{6})$ is equal to : (A) $\frac{\pi}{3}$ ● (B) $\frac{\pi}{6}$ (C) $\frac{\pi}{2}$ (D) $\frac{3\pi}{2}$
16	The relation between A, G, H is : (A) $G^2 = AH$ ● (B) $H^2 = AG$ (C) $A^2 = HG$ (D) $A > G < H$
17	The number of terms in the expansion of $(a+x)^n$ is : (A) n – 1 (B) n (C) n + 2 (D) n + 1 ●
18	$\sqrt{\frac{s(s-c)}{ab}} =$: (A) $\cos\frac{\alpha}{2}$ (B) $\sin\frac{\alpha}{2}$ (C) $\cos\frac{\gamma}{2}$ ● (D) $\sin\frac{\gamma}{2}$
19	A die is thrown, what is the probability to get 3 dots : (A) $\frac{1}{6}$ ● (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$
20	The period of $\cos\frac{x}{6}$ is : (A) 2π (B) 3π (C) 6π (D) 12π ●

Roll No _____ (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2023 – 2025)

MATHEMATICS 224-1st Annual-(INTER PART – I) Time Allowed : 2.30 hours
PAPER – I (Essay Type) GROUP – I Maximum Marks : 80

SECTION – I

2. Write short answers to any EIGHT (8) questions : **16**

(i) Write the symmetric property and transitive property of equality of the real numbers.

(ii) Show that $z\bar{z} = |z|^2 \ \forall z \in C$

(iii) Find out real and imaginary parts of $(\sqrt{3}+i)^3$

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

(v) Construct truth table for $(p \wedge \sim p) \rightarrow q$

(vi) If a, b are elements of a group G, then show that $(ab)^{-1} = b^{-1}a^{-1}$

(vii) If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, find the values of a and b.

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

(ix) Define skew-hermitain matrix.

(x) Evaluate $\omega^{28} + \omega^{29} + 1$

(xi) When $x^4 + 2x^3 + kx^2 + 3$ is divided by $x-2$, the remainder is 1. Find the value of k.

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

3. Write short answers to any EIGHT (8) questions : **16**

(i) Define partial fractions.

(ii) If $\frac{7x+25}{(x+3)(x+4)} = \frac{A}{x+3} + \frac{B}{x+4}$, then find B.

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

(iv) If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P., show that common ratio is $\pm\sqrt{\frac{a}{c}}$

(v) Find the sum of $\frac{9}{4} + \frac{3}{2} + 1 + \frac{2}{3} + - - - - - \infty$

(vi) If 5 is H.M. between 2 and b, then find b.

(vii) Write $\frac{(n+1)(n)(n-1)}{3.2.1}$ in factorial form.

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

(ix) Determine probability of getting 2 heads in two successive tosses of balanced coin.

(x) Show that $8.10^n - 2$ is divisible by 6 for n = 1 and n = 2

(xi) Find the 6th term in the expansion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

(xii) Using binomial theorem, find value of $\sqrt[3]{65}$ correct to three places of decimal.

(Turn Over)

4. Write short answers to any NINE (9) questions : 18

(i) Verify $\tan 2\theta = \dfrac{2\tan\theta}{1-\tan^2\theta}$ for $\theta = 45°$

(ii) Prove the identity $\dfrac{1+\cos\theta}{1-\cos\theta} = (\operatorname{cosec}\theta + \cot\theta)^2$

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

(iv) Express as product $\cos 6\theta + \cos 3\theta$

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

(vi) Prove that period of cosine is 2π

(vii) Find the period of $\operatorname{cosec} 10x$

(viii) Draw the graph of the function $y = \cos x$, $x \in \left[-\dfrac{\pi}{2}, \dfrac{\pi}{2}\right]$

(ix) Write formula for $\cos\dfrac{\alpha}{2}$ and $\cos\dfrac{\gamma}{2}$

(x) Measure of two sides of a triangle are in the ratio 3 : 2 and angle including these sides is 57°. Find the remaining two angles.

(xi) Define circum centre.

(xii) Without using calculator / table, show that $2\cos^{-1}\dfrac{4}{5} = \sin^{-1}\dfrac{24}{25}$

(xiii) Solve the trigonometric equation $\operatorname{cosec}^2\theta = \dfrac{4}{3}$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Show that $\begin{vmatrix} a+\lambda & b & c \\ a & b+\lambda & c \\ a & b & c+\lambda \end{vmatrix} = \lambda^2(a+b+c+\lambda)$ 5

(b) If the roots of the equation $x^2 - px + q = 0$ differ by unity, prove that $p^2 = 4q+1$ 5

6. (a) Resolve $\dfrac{1}{(x-3)^2(x+1)}$ into partial fractions 5

(b) Find n so that $\dfrac{a^n + b^n}{a^{n-1} + b^{n-1}}$ may be the A.M. between a and b 5

7. (a) Two dice are thrown. E_1 is the event that the sum of their dots is an odd numbers and E_2 is the event that 1 is the dot on the top of the first die. Show that $P(E_1 \cap E_2) = P(E_1) \cdot P(E_2)$ 5

(b) If $y = \dfrac{1}{3} + \dfrac{1.3}{2!}\left(\dfrac{1}{3}\right)^2 + \dfrac{1.3.5}{3!}\left(\dfrac{1}{3}\right)^3 + \text{----}$ prove that $y^2 + 2y - 2 = 0$ 5

8. (a) Reduce $\sin^4\theta$ to an expression involving only function of multiple of θ, raised to the first power. 5

(b) Prove that $\Delta = r^2 \cot\dfrac{\alpha}{2}\cot\dfrac{\beta}{2}\cot\dfrac{\gamma}{2}$ 5

9. (a) Find the values of all the trigonometric functions of the angle $-675°$. 5

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

Roll No _____ (To be filled in by the candidate)

MATHEMATICS **(Academic Sessions 2020 – 2022 to 2023 – 2025)**

Q.PAPER – I (Objective Type) 224-1st Annual-(INTER PART – I) Time Allowed : 30 Minutes

GROUP – II Maximum Marks : 20

PAPER CODE = 6196

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	If A is a matrix of order 2×3, then order of A^tA is : (A) 3×3 ● (B) 2×3 (C) 3×2 (D) 2×2
2	The equation $x(x-1)=x^2-x$ is : (A) Conditional (B) Identity ● (C) Exponential (D) Radical
3	The multiplicative inverse of $-i$ is : (A) $(1,-1)$ (B) $(0,-1)$ (C) $(0,1)$ ● (D) $(1,0)$
4	If ω is a cube root of unity, then $(1+\omega+\omega^2)^8 =$: (A) 0 ● (B) 256 (C) 256ω (D) $256\omega^2$
5	Which of the following sets has closure property w.r.t. addition : (A) $\{1\}$ (B) $\{0\}$ ● (C) $\{0,1\}$ (D) $\{1,-1\}$
6	If $\lvert A\rvert=9$, then $\lvert A^t\rvert$ is : (A) 81 (B) $\frac{1}{9}$ (C) -9 (D) 9 ●
7	The converse of $p \rightarrow q$ is : (A) $\sim p \rightarrow \sim q$ (B) $\sim q \rightarrow p$ (C) $q \rightarrow p$ ● (D) $p \rightarrow \sim q$
8	If $A=\{\}$, then the power set of A is : (A) ϕ (B) $\{0\}$ (C) $\{\}$ (D) $\{\phi\}$ ●
9	If $4^{1+x}=2$, then $x=$: (A) 0 (B) -2 (C) $-\frac{1}{2}$ ● (D) $\frac{1}{2}$
10	If $A \cap B = A$, then : (A) $B \subseteq A$ (B) $A \subseteq B$ ● (C) $A \cup B = A$ (D) $B \cup A = A$
11	$\sin(270° + \theta) =$: (A) $\sin\theta$ (B) $\cos\theta$ (C) $-\cos\theta$ ● (D) $-\sin\theta$
12	Which cannot be the term of a G P : (A) 1 (B) -1 (C) 0 ● (D) i

1-13	If $\sin x = -\frac{\sqrt{3}}{2}$, then the reference angle is : (A) $-\frac{\pi}{6}$ (B) $\frac{\pi}{6}$ (C) $-\frac{\pi}{3}$ (D) $\frac{\pi}{3}$ ●
14	Which angle is quadrantal angle : (A) 45° (B) 60° (C) 120° (D) 270° ●
15	With usual notation, $\frac{abc}{4R} =$: (A) r (B) r_1 (C) Δ ● (D) r_2
16	H.M. between 3 and 7 is : (A) 5 (B) $\sqrt{21}$ (C) $\pm\sqrt{21}$ (D) $\frac{21}{5}$ ●
17	The number of terms in the expansion of $(a+x)^n$ is : (A) n – 1 (B) n (C) n + 2 (D) n + 1 ●
18	The period of $\cos 2x$ is : (A) π ● (B) 2π (C) 4π (D) $\frac{\pi}{2}$
19	If r = n, then ${}^nC_r =$: (A) 0 (B) 1 ● (C) n (D) n!
20	$\sin^{-1}(0) + \cos^{-1}(0) =$: (A) 0 (B) $\frac{\pi}{2}$ ● (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

Roll No _____ (To be filled in by the candidate)

(Academic Sessions 2020 – 2022 to 2023 – 2025)

MATHEMATICS 224-1st Annual-(INTER PART – I) Time Allowed : 2.30 hours

PAPER – I (Essay Type) GROUP – II Maximum Marks : 80

SECTION – I

2. Write short answers to any EIGHT (8) questions : **16**

(i) Show that $z^2\bar{z}^2$ is a real number.

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

(iii) Simplify by justifying each step $\dfrac{\frac{1}{4}+\frac{1}{5}}{\frac{1}{4}-\frac{1}{5}}$

(iv) Check the closure property w.r.t. addition and multiplication for the set $\{0, -1\}$

(v) Determine whether the statement $p \wedge \sim p$ is tautology or not.

(vi) Define semi-group.

(vii) If $A=\begin{bmatrix}1\\1+i\\i\end{bmatrix}$, find $A(\bar{A})^t$

(viii) Define reduced echelon form of a matrix, with example.

(ix) If $A=\begin{bmatrix}2 & -1\\3 & 1\end{bmatrix}$, verify that $(A^{-1})^t=(A^t)^{-1}$

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

(xi) Solve the equations $x^2+y^2=25$, $2x^2+3y^2=6$

(xii) Find the condition that one root of $x^2+px+q=0$ is square of other.

3. Write short answers to any EIGHT (8) questions : **16**

(i) Define proper rational fraction.

(ii) For the identity $\dfrac{1}{(x-1)(2x-1)(3x-1)}=\dfrac{A}{x-1}+\dfrac{B}{2x-1}+\dfrac{C}{3x-1}$ calculate the value of A.

(iii) Find the next two terms of 1, 3, 7, 15, 31, ----

(iv) How many terms are there in the A.P. in which $a_1=11$, $a_n=68$, $d=3$

(v) Find three A.Ms between $\sqrt{2}$ and $3\sqrt{2}$.

(vi) Find the 12th term of $1+i, 2i, -2+2i, \ldots$

(vii) Show that ${}^{16}C_{11}+{}^{16}C_{10}={}^{17}C_{11}$

(viii) Evaluate ${}^{12}C_3$

(ix) What is sample space and events?

(x) State principle of mathematical induction.

(xi) Calculate $(9.98)^4$ by means of binomial theorem.

(xii) Prove that $n!>2^n-1$ for $n=4,5$

4. Write short answers to any NINE (9) questions : **18**

(i) What is length of an arc intercepted on a circle of radius 14 cm by the arms of a central angle 45^o?

(ii) Convert $54°45'$ into radians.

(Turn Over)

4. (iii) If α, β, γ are angles of triangle ABC then prove that $\cos\left(\frac{\alpha+\beta}{2}\right)=\sin\frac{\gamma}{2}$

(iv) Find the value of $\cos\frac{\pi}{12}$

(v) Express $\sin(x+30°)+\sin(x-30°)$ as a product.

(vi) Define periodic function and period of trigonometric function.

(vii) Find period of $\cos\frac{x}{6}$

(viii) Draw the graph of $y=\sin x$ from 0 to π.

(ix) State law of sines.

(x) If sides of triangle are 16, 20, 23, find its greatest angle.

(xi) Show that $r_1 = s\tan\frac{\alpha}{2}$

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

(xiii) Show that $\tan\left(\sin^{-1}x\right)=\frac{x}{\sqrt{1-x^2}}$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Solve the system of equations by Cramer's rule : 5

$$2x+2y+z=3$$
$$3x-2y-2z=1$$
$$5x+y-3z=2$$

(b) If α, β roots of $x^2-3x+5=0$ form the equation whose roots are $\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$ 5

6. (a) Resolve $\frac{x^4}{1-x^4}$ into partial fractions 5

(b) The sum of an infinite geo-metric series is 9 and the sum of the squares of its terms is $\frac{81}{5}$. Find the series. 5

7. (a) Find the values of n and r when ${}^{n-1}C_{r-1} : {}^{n}C_{r} : {}^{n+1}C_{r+1} = 3:6:11$ 5

(b) If x is so small that its cube and higher powers can be neglected, then show that : $\sqrt{\frac{1-x}{1+x}} \approx 1-x+\frac{x^2}{2}$ 5

8. (a) Reduce $\cos^4\theta$ to an expression involving only function of multiples of θ, raised to the first power. 5

(b) Prove that $r_3 = 4R\cos\frac{\alpha}{2}\cos\frac{\beta}{2}\sin\frac{\gamma}{2}$ 5

9. (a) Show that the area of a sector of a circular region of radius r is $\frac{1}{2}r^2\theta$, where θ is the circular measure of the central angle of the sector. 5

(b) Prove that $\sin^{-1}\frac{1}{\sqrt{5}}+\cot^{-1}3=\frac{\pi}{4}$ 5

Roll No. _____

MATHEMATICS **Intermediate Part-I , Class 11th (1stA 324- IV)** **PAPER: I** **GROUP - I**

Time: 30 Minutes **OBJECTIVE** **Marks: 20**

Code: 6197

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 circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

1- 1- A square matrix A is symmetric if $A^t =$

(A) $-A$ (B) A ● (C) $\overline{A}$ (D) $-\overline{A}$

2- If $\sin\theta > 0$ and $\sec\theta > 0$, then terminal arm of θ lies in quadrant

(A) I ● (B) II (C) III (D) IV

3- Conditional equation $3x - 1 = 0$ is true only if

(A) $x = 3$ (B) $x = -3$ (C) $x = \frac{1}{3}$ ● (D) $x = -\frac{1}{3}$

4- Reference angle always lies in quadrant

(A) I ● (B) II (C) III (D) IV

5- $\cos\left(\sin^{-1}\frac{1}{\sqrt{2}}\right) =$

(A) $\frac{1}{\sqrt{2}}$ ● (B) 1 (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{4}$

6- The value of the determinant $\begin{vmatrix} 1 & 12 & 25 \\ 0 & 3 & 15 \\ 0 & 0 & 8 \end{vmatrix}$ is

(A) 0 (B) 1 (C) 8 (D) 24 ●

7- $\sin(\pi - \theta) =$

(A) $\sin\theta$ ● (B) $-\sin\theta$ (C) $\cos\theta$ (D) $-\cos\theta$

8- If "n" is even , then middle term of $(a + b)^n$ is

(A) $\left(\frac{n}{2}-1\right)^{th}$ term (B) $\left(\frac{n}{2}+1\right)^{th}$ term ● (C) $\left(\frac{n}{2}\right)^{th}$ term (D) $\left(\frac{n}{2}-2\right)^{th}$ term

9- When $3x^4 + 4x^3 + x - 5$ is divided by $x + 1$, then remainder is

(A) -7 ● (B) -6 (C) 6 (D) 7

10- Converse of the conditional $p \rightarrow q$ is

(A) $q \rightarrow p$ ● (B) $\sim q \rightarrow \sim p$ (C) $\sim p \rightarrow \sim q$ (D) $p \rightarrow \sim q$

11- Multiplicative inverse of $-3i$ is

(A) $3i$ (B) $\frac{1}{3}i$ ● (C) $-\frac{1}{3}i$ (D) $-3i$

12- $A' \cap B' =$

(A) $A' - B'$ (B) $A' \cup B'$ (C) $(A \cap B)'$ (D) $(A \cup B)'$ ●

13- In a quadratic equation $ax^2 + bx + c = 0$, if $b^2 - 4ac > 0$, then roots are

(A) real ● (B) equal (C) rational (D) irrational

14- 20^{th} term of 1 , 3 , 5 , ... is

(A) 38 (B) 39 ● (C) 40 (D) 41

(Turn over)

15- $\sqrt{3}$ is

(A) rational number (B) irrational number ● (C) even number (D) odd number

16- $r_2 =$

(A) $\frac{\Delta}{S}$ (B) $\frac{\Delta}{S-a}$ (C) $\frac{\Delta}{S-b}$ ● (D) $\frac{\Delta}{S-c}$

17- Factorial form of $(n+2)(n+1)(n)$ is

(A) $\frac{(n+2)!}{(n+1)!}$ (B) $\frac{(n+1)!}{(n-2)!}$ (C) $\frac{(n+2)!}{n!}$ (D) $\frac{(n+2)!}{(n-1)!}$ ●

18- Tanθ is a periodic function of period

(A) π ● (B) $\frac{\pi}{2}$ (C) $\frac{3\pi}{2}$ (D) 2π

19- Let A={1,2,3}, then the number of its subsets is

(A) 2 (B) 3 (C) 7 (D) 8 ●

20- If $a = 2i$, $b = 4i$, then G =

(A) $\pm 2\sqrt{2}\, i$ ● (B) $\pm 2\, i$ (C) $\pm 4\, i$ (D) $\pm\sqrt{6}\, i$

213-(IV)-1st A 324-32000

MATHEMATICS **Intermediate Part-I , Class 11th (1stA 324)** **PAPER: I** **GROUP - I**

Time: 2:30 hours **SUBJECTIVE** **Marks: 80**

Note: Section-I is compulsory. Attempt any three (3) questions from Section-II.

SECTION-I

2. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Define binary operation.

ii- Show that the set $\{1, -1\}$ possess closure property with respect to multiplication.

iii- Simplify the following $(-1)^{\frac{-21}{2}}$

iv- Graph the number $-5 - 6i$ on complex plane.

v- Write the union and intersection of two sets A and B in set builder notation.

vi- Write down the difference between induction and deduction.

vii- Find the value of 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 non-singular matrices then show that $(AB)^{-1} = B^{-1}A^{-1}$

ix- Write down two properties of determinant.

x- Solve the equation : $x^{1/2} - x^{1/4} - 6 = 0$

xi- Show that : $x^3 + y^3 + z^3 = (x + y + z)(x+\omega y+\omega^2 z)(x+\omega^2 y+\omega z)$

xii- Show that $(x - 2)$ is a factor of $x^4 - 13x^2 + 36$

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- What is the difference between proper rational fraction and improper rational fraction?

ii- Find value of A and B if $\frac{x^2+1}{(x+1)(x-1)} = \frac{A}{x+1} + \frac{B}{x-1}$

iii- Which term of the A.P 5 , 2 , –1 , ... is –85 ?

iv- Find the sum of infinite G.P : $2, \sqrt{2}, 1, \ldots\ldots$

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

vi- If $\frac{1}{K}$, $\frac{1}{2K+1}$ and $\frac{1}{4K-1}$ are in harmonic sequence , find K.

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

viii- Find the number of the diagonals of a 6–sided figure.

ix- Two dice are thrown twice. What is probability that sum of dots shown in throw is 7?

x- Prove that the statement is true : $n! > n^2$ for $n = 4, 5$

xi- Use Binomial theorem, find the value of $(.98)^{1/2}$ up to three decimal places.

xii- Find the term involving a^4 in the expansion of $\left(\frac{2}{x} - a\right)^9$

4. Write short answers to any NINE questions: **(2 x 9 = 18)**

i- Define Radian.

ii- $\sin\theta = \frac{12}{13}$, terminal arm of the angle is in quadrant I. Find the values of $\sec\theta$, $\cos\theta$

iii- Prove that $\cos\left(\frac{\pi}{2} - \beta\right) = \sin\beta$

(Turn Over)

iv- Prove that $\frac{\text{Cos}\,11^\circ + \text{Sin}\,11^\circ}{\text{Cos}\,11^\circ - \text{Sin}\,11^\circ} = \tan 56^\circ$

v- Express the product $\text{Sin}\,12^\circ\ \text{Sin}\,46^\circ$ as sum or difference.

vi- Prove that period of tangent is π

vii- Find the period of $3\text{Sin}x$

viii- Draw the graph $y = -\text{Sin}x\ ,\ x \in [-2\pi\ ,\ 2\pi]$

ix- Find the value of θ if $\text{Cos}\theta = 0.9316$

x- Solve the right angle triangle in which $\gamma = 90^\circ\ ,\ \alpha = 37^\circ 20'\ ,\ a = 243$

xi- Solve the triangle ABC , if $\beta = 60^\circ\ ,\ \gamma = 15^\circ\ ,\ b = \sqrt{6}$

xii- Find the value of $\text{Cos}^{-1}(1/2)$

xiii- Solve the equation : $\text{Sin}^2x + \text{Cos}x = 1$

SECTION-II

5- (a) Show that $\begin{vmatrix} a+\lambda & b & c \\ a & b+\lambda & c \\ a & b & c+\lambda \end{vmatrix} = \lambda^2(a+b+c+\lambda)$ 5

(b) If α and β are the roots of $x^2 - 3x + 5 = 0$, form the equation whose roots are : 5

$\frac{1-\alpha}{1+\alpha}$ and $\frac{1-\beta}{1+\beta}$

6- (a) Resolve $\frac{x^2}{(x^2+4)(x+2)}$ into partial fractions. 5

(b) Find a_n of a G.P if $a_4 = \frac{8}{27}$ and $a_7 = -\frac{64}{729}$ 5

7- (a) Prove that : ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^{n}C_r$ 5

(b) Show that : $\frac{n^3+2n}{3}$ represents an integer $\forall\ n \in N$ 5

8- (a) Prove that $\frac{\text{Sin}\theta + \text{Sin}3\theta + \text{Sin}5\theta + \text{Sin}7\theta}{\text{Cos}\theta + \text{Cos}3\theta + \text{Cos}5\theta + \text{Cos}7\theta} = \tan 4\theta$ 5

(b) With usual notations, prove that $a^2 = b^2 + c^2 - 2bc\text{Cos}\alpha$ 5

9- (a) If $\tan\theta = -\frac{1}{3}$, and terminal arm of angle θ is in quadrant II. Find the values of remaining trignometric functions. 5

(b) Prove that $\tan^{-1}\frac{3}{4} + \tan^{-1}\frac{3}{5} + \tan^{-1}\frac{8}{19} = \frac{\pi}{4}$ 5

Roll No. _____

MATHEMATICS **Intermediate Part-I , Class 11th (1st A 324- IV)** **PAPER: I** **GROUP: II**

Time: 30 Minutes **OBJECTIVE** **Marks: 20**

Code: 6198

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 circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question.

1- 1- a , b and c are in A.P , then

(A) $2a = b - c$ (B) $2b = a + c$ ● (C) $2b = a - c$ (D) $2a = b + c$

2- Number of terms in expansion of $(1 + x)^{n-1}$ is

(A) $n + 2$ (B) $n + 1$ (C) n ● (D) $n - 1$

3- H is Harmonic mean between a and b then H = _____ .

(A) $\frac{2ab}{a+b}$ ● (B) $\frac{a+b}{2ab}$ (C) $\frac{2ab}{a-b}$ (D) $\frac{a-b}{2ab}$

4- $\cos(\tan^{-1}0) =$ _____

(A) 0 (B) 1 ● (C) –1 (D) ∞

5- In $\frac{p(x)}{q(x)}$, degree of p(x) is less than degree of q(x), then fraction is

(A) proper ● (B) improper (C) combined (D) partial

6- Set having no proper subset

(A) { } (B) { 1 } ● (C) { 1 , 2} (D) { 1 , 2 , 3 }

7- Recurring decimal is a _____ number.

(A) prime (B) rational ● (C) irrational (D) integer

8- Sum of roots of equation $x^2 - 5x + 6 = 0$

(A) 6 (B) –6 (C) 5 ● (D) –5

9- ${}^nC_8 = {}^nC_{12}$, then value of n is

(A) 8 (B) 12 (C) 16 (D) 20 ●

10- Proposition _____ is called biconditional

(A) $p \rightarrow q$ (B) $p \leftrightarrow q$ ● (C) $p \wedge q$ (D) $p \vee q$

11- $\sin x = \frac{1}{2}$, then x = _____.

(A) $\frac{\pi}{6}$ ● (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

12- Number of radians in semi-circle

(A) $\frac{\pi}{2}$ (B) π ● (C) 2π (D) $\frac{2\pi}{3}$

13- $3^{2x} + 4.3^x + 4 = 0$ is _____ equation.

(A) cubic (B) radical (C) reciprocal (D) exponential ●

14- Period of tanx is

(A) $\frac{\pi}{2}$ (B) 3π (C) 2π (D) π ●

15- $(-1)^{-\frac{21}{2}} =$ .....

(A) 1 (B) –1 (C) i (D) $-i$ ●

16- If $\begin{bmatrix} x & 1 \\ 3 & 1 \end{bmatrix}$ is singular, then x = _____ .

(A) –3 (B) 3 ● (C) 1 (D) –1

17- Sum of opposite angles of cyclic quadrilateral is

(A) 90 (B) 120 (C) 180 ● (D) 270

18- The matrix [1 2 3] is _____ matrix.

(A) square (B) unit (C) null (D) row ●

19- Co-ratio of Cosine is

(A) sine (B) cosine (C) tangent (D) secant ●

20- If A = {1 , 2 , 3} and B = {4 , 5} , which is not element of A x B

(A) (1 , 4) (B) (2 , 4) (C) (3 , 4) (D) (4 , 3) ●

M... ...EMATICS | Intermediate Part-I , Class 11th (1st A 324) | PAPER: I | GROUP: II
Time: 2:30 hours | SUBJECTIVE | Marks: 80

Note: Section-I is compulsory. Attempt any three (3) questions from Section-II.

SECTION-I

2. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Write trichotomy and transitive properties of inequalities of real numbers.
ii- Simplify $(2, 6) \div (3, 7)$
iii- Find the modulus of $3 + 4i$
iv- Express the complex number $1 + i\sqrt{3}$ in polar form
v- Write inverse , converse and contrapositive of the conditional $\sim p \rightarrow \sim q$
vi- Define groupoid.
vii- If $A = \begin{bmatrix} i & 0 \\ 1 & -i \end{bmatrix}$, show that $A^4 = I_2$
viii- Without expansion verify that $\begin{vmatrix} \alpha & \beta+\gamma & 1 \\ \beta & \gamma+\alpha & 1 \\ \gamma & \alpha+\beta & 1 \end{vmatrix} = 0$
ix- If A and B are non-singular matrices, then show that $(AB)^{-1} = B^{-1}A^{-1}$
x- Find the three cube roots of -27
xi- Use the factor theorem to determine if $x - 1$ is a factor of $x^2 + 4x - 5$
xii- If α , β are the roots of $3x^2 - 2x + 4 = 0$, find the value of $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Resolve into Partial Fractions $\frac{3x}{(x-1)(x+2)}$
ii- Define the term Partial Fraction.
iii- Write the first four terms of the sequence, if $a_n - a_{n-1} = n + 2$, $a_1 = 2$
iv- If 5 , 8 are two A.Ms between a and b , find a and b.
v- Find the sum of infinite Geometric Series $\frac{9}{4} + \frac{3}{2} + 1 + \frac{2}{3} + \ldots\ldots\infty$
vi- Find the 8^{th} term of H.P ; $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \ldots\ldots\ldots$
vii- Prove that ${}^nC_r = {}^nC_{n-r}$
viii- Find the value of n when ${}^{11}P_n = 11.10.9$
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- Prove that the inequality $n^2 > n + 3$ for $n = 3, 4$
xi- Calculate $(9.9)^5$ by means of Bionomial Theorem.
xii- Expand $(1 - x)^{1/2}$ upto 4 terms.

Write short answers to any NINE questions: **(2 x 9 = 18)**

i- Find r when $\ell = 5\text{cm}$, $\theta = \frac{1}{2}$ radian
ii- Evaluate $\frac{\tan\frac{\pi}{3} - \tan\frac{\pi}{6}}{1 + \tan\frac{\pi}{3} \cdot \tan\frac{\pi}{6}}$
iii- Prove that $\text{Sin}(\alpha + \beta)\ \text{Sin}(\alpha - \beta) = \text{Cos}^2\beta - \text{Cos}^2\alpha$

(Turn Over)

iv- Prove that $\frac{\text{Cos}8^\circ - \text{Sin}8^\circ}{\text{Cos}8^\circ + \text{Sin}8^\circ} = \tan 37^\circ$

v- Express as product : $\text{Cos}7\theta - \text{Cos}\theta$

vi- Define Periodicity.

vii- Find period of $3\text{Cos}\frac{x}{5}$

viii- Draw graph of Sinx when $x \in [0, \pi]$

ix- Find a and c for the right angle triangle ABC, when $\alpha = 58°13'$, $b = 125.7$, $\gamma = 90°$

x- A vertical pole is 8m high and length of its shadow is 6m. What is angle of elevation of the sum at that moment?

xi- Solve the triangle ABC if $b = 125$, $\gamma = 53°$, $\alpha = 47°$

xii- Show that $\tan(\text{Sin}^{-1}x) = \frac{x}{\sqrt{1-x^2}}$

xiii- Solve the trignometric equation $\text{Sin}x = -\frac{\sqrt{3}}{2}$

SECTION-II

5- (a) Solve the system of linear equations by Cramer's Rule : 5

$$2x + 2y + z = 3$$
$$3x - 2y - 2z = 1$$
$$5x + y - 3z = 2$$

(b) Show that the roots of $(mx + c)^2 = 4ax$ will be equal if $c = \frac{a}{m}$, $m \neq 0$ 5

6- (a) Resolve $\frac{x^2 + x - 1}{(x+2)^3}$ into partial fractions. 5

(b) The sum of an infinite Geometric Series is 9 and the sum of the squares of its terms is $\frac{81}{5}$. 5

Find the series.

7- (a) Two dice are thrown. E_1 is the event that the sum of their dots is an odd number and E_2 is the event that 1 is the dot on the top of the first die. Show that $P(E_1 \cap E_2) = P(E_1) \cdot P(E_2)$ 5

(b) Find the term independent of x in expansion of $\left(\sqrt{x} + \frac{1}{2x^2}\right)^{10}$ 5

8- (a) Prove that $\text{Sin}\frac{\pi}{9}\text{Sin}\frac{2\pi}{9}\text{Sin}\frac{\pi}{3}\text{Sin}\frac{4\pi}{9} = \frac{3}{16}$ 5

(b) Show that $r_2 = 4R\,\text{Cos}\frac{\alpha}{2}\text{Sin}\frac{\beta}{2}\text{Cos}\frac{\gamma}{2}$ 5

9- (a) Find x if $\tan^2 45° - \text{Cos}^2 60° = x\text{Sin}45°\,\text{Cos}45°\tan 60°$ 5

(b) Prove that $\text{Sin}^{-1}\frac{4}{5} + \text{Sin}^{-1}\frac{5}{13} + \text{Sin}^{-1}\frac{16}{65} = \frac{\pi}{2}$ 5

Paper Code Number: 2197	2024 (1st-A) INTERMEDIATE PART-I (11th Class)	Roll No: _____
MATHEMATICS PAPER-I GROUP-I	pakcity.org	
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	Inverse of square matrix exists if it is:	Singular	Non-singular ●	Null	Symmetric
2	If A is skew symmetric, then A^2 will be _____.	Symmetric ●	Skew symmetric	Hermitian	Skew Hermitian
3	Product of roots of $x^2-5x+6=0$ is:	-6	6 ●	5	-5
4	Roots of equation $cx^2+ax+b=0$ are complex if:	$b^2-4ac<0$ ●	$c^2-4ab<0$	$a^2-4bc<0$	$a^2-4ac<0$
5	$\frac{1}{x^3+1}=\frac{1}{x+1}+\frac{\text{Numenator of } x^2-x+1}{x^2-x+1}$	$Bx+c$ ●	B	C	$B+C$
6	Next term of 1, 3, 12, 60, _____ is:	120	180	240	360 ●
7	General term of $-2, 1, 4, 7,$ _____ is:	$3n-2$ ●	$3n-4$	$3n-3$	$3n-5$
8	A die is rolled, probability that dots on top are greater than 4:	$\frac{1}{2}$	$\frac{1}{3}$ ●	$\frac{1}{4}$	$\frac{1}{6}$
9	Sum of odd coefficients in expansion of $(1+x)^4$ is:	8 ●	16	18	6
10	-1035° is coterminal with _____	60°	30°	45° ●	35°
11	$\cos(\alpha+\beta)-\cos(\alpha-\beta)=$	$-2\cos\alpha\cos\beta$	$2\cos\alpha\cos\beta$	$2\sin\alpha\sin\beta$	$-2\sin\alpha\sin\beta$ ●
12	Period of $\sec x$ is:	π	2π ●	3π	$\frac{\pi}{2}$
13	$\sqrt{\frac{s(s-a)}{bc}}=$ ___	$\cos\frac{\alpha}{2}$ ●	$\sin\frac{\alpha}{2}$	$\tan\frac{\alpha}{2}$	$\cot\frac{\alpha}{2}$
14	$\tan[\tan^{-1}(-1)]=$ _____	1	-1 ●	$\frac{\pi}{4}$	$-\frac{\pi}{4}$
15	$\sin x\cos x=\frac{\sqrt{3}}{4}$, then $x=$ _____	$\frac{\pi}{2}$	$\frac{\pi}{3}$ ●	$\frac{\pi}{6}$	$\frac{\pi}{4}$
16	$3x+y^2i=1-2i^2$, then value of x is:	$\frac{1}{3}$	1 ●	3	Zero
17	If $z=\sqrt{3}+i$, then $\lvert z\rvert=$_____	4	$\sqrt{3}-i$	$-\sqrt{3}+i$	2 ●
18	Inverse of $p\to q$ is _____.	$\sim p\to\sim q$ ●	$\sim q\to\sim p$	$\sim q\to p$	$q\to\sim p$
19	Set A contains 4 elements, then number of elements in its power set $P(A)$:	8	12	16 ●	4
20	$\{1,-1\}$ is group with respect to:	Addition	Subtraction	Square root	Multiplication ●

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)	Simplify $(2, 6) \div (3, 7)$	(ii)	Separate into real and imaginary parts $\frac{i}{1+i}$
(iii)	$\forall z \in C$, prove that $\lvert -z\rvert = \lvert z\rvert = \lvert \bar{z}\rvert = \lvert -\bar{z}\rvert$	(iv)	Find the multiplicative inverse of $-3-5i$.
(v)	Express $\{x \mid x \in N \wedge x \leq 10\}$ in descriptive and tabular form.		
(vi)	Show $B-A$ by Venn diagram when $A \subseteq B$	(vii)	Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} y & 1 \\ -3 & 2x \end{bmatrix}$
(viii)	If $A = \begin{bmatrix} 1 & -1 \\ a & b \end{bmatrix}$, $A^2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, find the values of a and b.	(ix)	Without expansion show that $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = 0$
(x)	Find roots of the equation $5x^2 - 13x + 6 = 0$ by using quadratic formula.		
(xi)	Find four 4^{th} roots of unity.	(xii)	Solve the equation $4^x = \frac{1}{2}$

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

(i)	Define Rational fraction.		
(ii)	Write in to partial fractions $\frac{8x^2}{(x^2+1)^2(1-x^2)}$ without finding constants.		
(iii)	Write the first four terms of the sequence $a_n = (-1)^n (2n-3)$		
(iv)	How many terms are there in A.P in which $a_1 = 11$, $a_n = 68$, $d = 3$?		
(v)	Sum the series $1+4-7+10+13-16+19+22-25+$ _____ to $3n$ terms.		
(vi)	Find the sum of the infinite series $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} +$ _____		
(vii)	How many signals can be made with 4-different flags when any number of them are to be used at a time?		
(viii)	If ${}^nC_8 = {}^nC_{12}$, find n.		
(ix)	Determine the probability of getting 2 heads in two successive tosses of a balanced coin.		
(x)	Prove $2+6+18+$ _____ $+2 \times 3^{n-1} = 3^n - 1$ for $n = 1, 2$		
(xi)	Calculate $(21)^5$ by means of Binomial theorem.	(xii)	Expand $(1+x)^{\frac{-1}{3}}$ up to 4 terms.

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

(i)	In a right angle triangle ABC, prove that $\sin^2\theta + \cos^2\theta = 1$		
(ii)	Prove that $\cot^2\theta - \cos^2\theta = \cot^2\theta \cos^2\theta$	(iii)	Prove that $\sin 3\alpha = 3\sin\alpha - 4\sin^3\alpha$
(iv)	Express the product as sum or difference $\sin 12^\circ \sin 46^\circ$	(v)	Prove that $\tan\left(\frac{\pi}{4}-\theta\right) + \tan\left(\frac{3\pi}{4}+\theta\right) = 0$
(vi)	Define period of a trigonometric function.	(vii)	Find the period of $\operatorname{cosec}\frac{x}{4}$
(viii)	Draw the graph of $y = \tan x$ for $-\pi \leq x \leq \pi$.		
(ix)	Find area of triangle ABC, if $a = 4.33$, $b = 9.25$, $\gamma = 56^\circ 44'$		
(x)	Find R, if sides of triangle ABC are $a = 13$, $b = 14$, $c = 15$	(xi)	Show that $\frac{1}{2rR} = \frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca}$
(xii)	Without using calculator, show that $\cos^{-1}\frac{4}{5} = \cot^{-1}\frac{4}{3}$	(xiii)	Find the solution of $\sin x \cos x = \frac{\sqrt{3}}{4}$

SECTION-II

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

5.(a)	Use synthetic division to find the values of p and q if $x+1$ and $x-2$ are the factors of the polynomial $x^3 + px^2 + qx + 6$		
(b)	Use matrices to solve the system of equations $x_1 - 2x_2 + x_3 = -4$, $2x_1 - 3x_2 + 2x_3 = -6$, $2x_1 + 2x_2 + x_3 = 5$		
6.(a)	Resolve into partial fractions $\frac{1}{(x-1)^2(x+1)}$		
(b)	Show that the sum of n A.Ms. between a and b is equal to n times their A.M.		
7.(a)	Find values of n and r when ${}^nC_r = 35$, ${}^nP_r = 210$		
(b)	Using Mathematical induction to show that $1+2+2^2+$ _____ $+2^n = 2^{n+1} - 1$ for all non-negative integers n.		
8.(a)	Prove without using calculator $\sin 19^\circ \cos 11^\circ + \sin 71^\circ \sin 11^\circ = \frac{1}{2}$		
(b)	Solve the triangle ABC in which $a = 36.21$, $c = 30.14$ and $\beta = 78^\circ 10'$		
9.(a)	Prove that $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \tan\theta + \sec\theta$	(b)	Prove that $\sin^{-1}\frac{4}{5} + \sin^{-1}\frac{5}{13} + \sin^{-1}\frac{16}{65} = \frac{\pi}{2}$

Paper Code Number: 2198	2024 (1st-A) INTERMEDIATE PART-I (11th Class)	Roll No: _____
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	Sum of binomial coefficients is:	2^n ●	n	$2n$	n^2
2	Trigonometric ratio of -330^o is same as:	60^o	30^o ●	45^o	90^o
3	$\frac{3\pi}{2}+\theta$ lies in quadrant:	1st	2nd	3rd	4th ●
4	Range of $y=\sin x$ is:	$(-1, 1)$	$[-1, 1)$	$[-1, 1]$ ●	$(-1, 1]$
5	In right triangle, no angle is greater than:	45^o	80^o	60^o	90^o ●
6	Domain of $y=\sin^{-1}(x)$ is:	$-1\le x\le 1$ ●	$-1\ge x\ge 1$	$-1<x<1$	$0\le x\le 1$
7	If $\cos x=\frac{1}{\sqrt{2}}$, then reference angle is:	$\frac{\pi}{6}$	$\frac{\pi}{4}$ ●	$\frac{\pi}{3}$	$\frac{\pi}{2}$
8	Every non-recurring, non terminating decimals represents:	Rational number	Natural number	Irrational number ●	Whole number
9	The multiplicative inverse of complex number $(0, 1)$ is:	$(0, -1)$ ●	$(0, 1)$	$(-1, 0)$	$(0, 0)$
10	How many inverse elements correspond to each element of group?	At least two	Two	At least one	Only one ●
11	Set containing elements A or B is denoted by:	$A\cap B$	$A\cup B$ ●	$A\subseteq B$	$B\supseteq A$
12	$p\to q$ is called converse of:	$\sim p\to q$	$p\to q$	$q\to p$ ●	$\sim q\to p$
13	The inverse of square matrix exists if A is:	Singular	Non-singular ●	Symmetric	Rectangular
14	If A is a square matrix of order 2×2 then $\lvert KA\rvert$ equals:	$K\lvert A\rvert$	$\frac{1}{K}\lvert A\rvert$	$K^2\lvert A\rvert$ ●	$2K\lvert A\rvert$
15	If $4^x=\frac{1}{2}$ then x is equal to:	$-\frac{1}{2}$ ●	-2	$\frac{1}{2}$	$\frac{1}{4}$
16	The roots of the equation $x^2-5x+6=0$ are:	$2, -3$	$-2, -3$	$2, 3$ ●	$-2, 3$
17	The fraction $\frac{x-3}{x+1}$ is:	Improper ●	Proper	Identity	Equivalent
18	G.M between $\frac{1}{a}$ and $\frac{1}{b}$ is:	$-\frac{1}{ab}$	$\pm\sqrt{\frac{1}{ab}}$ ●	ab	$-\sqrt{ab}$
19	$\sum_{k=1}^{n}1$ is equal to:	1	n^3	n ●	n^2
20	$\frac{3!}{0!}$ is equal to:	3	6 ●	∞	12

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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)	Simplify $(2, 6) \div (3, 7)$	(ii)	Find multiplicative inverse of $a + ib$
(iii)	Show that for all $z \in C$, $z\bar{z} = \lvert z \rvert^2$	(iv)	Simplify $\frac{3}{\sqrt{6}-\sqrt{-12}}$
(v)	For $A=\{1, 2, 3, 4\}$, state the domain and range of relation $\{(x, y) \mid x+y=5\}$		
(vi)	Define Semi group.	(vii)	If $A=\begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$, find A^{-1}
(viii)	If $A=\begin{bmatrix} 2 & 3 \\ 1 & 5 \end{bmatrix}$, then show that $4A-3A=A$	(ix)	If $A=\begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$, then find A_{12}, A_{22}
(x)	Discuss the nature of roots of $2x^2+5x+1=0$	(xi)	Evaluate $(1+\omega-\omega^2)^8$
(xii)	Solve by completing the square $x^2+6x-567=0$		

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

(i)	Define Identity. Give one example.		
(ii)	Write $\frac{2x-3}{x(2x+3)(x-1)}$ in partial fraction form without finding constants.		
(iii)	If $a_{n-3}=2n-5$, then find nth term of sequence.	(iv)	Find b if 5, 8 are two A.Ms. between a and b.
(v)	If $y=1+\frac{x}{2}+\frac{x^2}{4}+\_\_\_\_$, then find the interval in which the series is convergent.		
(vi)	If $\frac{1}{k}, \frac{1}{2k+1}, \frac{1}{4k-1}$ are in H.P, then find k.		
(vii)	In how many ways can 4 keys be arranged on a circular key ring?		
(viii)	Find the number of diagonals of 12 sided figure.		
(ix)	If $P(A)=\frac{1}{2}$; $P(B)=\frac{1}{2}$; $P(A\cap B)=\frac{1}{3}$, then find $P(A\cup B)$		
(x)	Prove that $4^n > 3^n + 2^{n-1}$ for $n=2$ and $n=3$	(xi)	Expand $\left(3a-\frac{x}{3a}\right)^4$ by binomial theorem.
(xii)	If x is so small that its square and higher powers be neglected, then show that $\sqrt{\frac{1-x}{1+x}}=1-x$		

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

(i)	Prove that $\sin^2\frac{\pi}{6}+\sin^2\frac{\pi}{3}+\tan^2\frac{\pi}{4}=2$	(ii)	Show that $\frac{1}{1+\sin\theta}+\frac{1}{1-\sin\theta}=2\sec^2\theta$
(iii)	Prove that $\sin(180^\circ+\alpha)\cdot\sin(90^\circ-\alpha)=-\sin\alpha\cdot\cos\alpha$	(iv)	Find the value of $\cos 105^\circ$
(v)	Show that $\frac{\sin 3\theta}{\sin\theta}-\frac{\cos 3\theta}{\cos\theta}=2$	(vi)	Write domain and range of $y=\sin x$
(vii)	Find the period of $\tan 4x$	(viii)	Draw the graph of $y=\sin x$ from 0 to π
(ix)	In ΔABC if $\beta=60^\circ$; $\gamma=15^\circ$; $b=\sqrt{6}$, then find a and γ		
(x)	Find area of ΔABC in which $\alpha = 45^\circ 17'$; $\gamma = 36^\circ 41'$; $b = 25.4$	(xi)	Define inscribed circle
(xii)	Find the value of $\sec\left[\sin^{-1}\left(-\frac{1}{2}\right)\right]$	(xiii)	Define trigonometric equation. Give one example.

SECTION-II

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

5.(a)	Find the inverse of $A=\begin{bmatrix} 2 & 1 & 0 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{bmatrix}$ and show that $A^{-1}A=I_3$		
(b)	Prove that $\frac{x^2}{a^2}+\frac{(mx+c)^2}{b^2}=1$ will have equal roots, if $c^2=a^2m^2+b^2$; $a\neq 0$, $b\neq 0$		
6.(a)	Resolve $\frac{x^2+1}{x^3+1}$ into partial fractions.	(b)	The sum of three numbers in an A.P is 24 and their product is 440. Find the numbers.
7.(a)	A number is chosen out of first fifty natural numbers. What is probability that chosen number is multiple of 3 or of 5.		
(b)	Show that $\left[\frac{n}{2(n+N)}\right]^{\frac{1}{2}}=\frac{8n}{9n-N}-\frac{n+N}{4n}$ where n and N are nearly equal.		
8.(a)	Prove without using calculator that $\sin 19^\circ\cos 11^\circ+\sin 71^\circ\sin 11^\circ=\frac{1}{2}$		
(b)	Find the area of the triangle ABC, when $\alpha=35^\circ 17'$, $\gamma=45^\circ 13'$ and $b=42.1$		
9.(a)	Prove the identity and state the domain of θ $\sin^6\theta+\cos^6\theta=1-3\sin^2\theta\cos^2\theta$		
(b)	Prove that $\tan^{-1}\frac{1}{11}+\tan^{-1}\frac{5}{6}=\tan^{-1}\frac{1}{3}+\tan^{-1}\frac{1}{2}$		

☆☆☆☆ Roll No _____

HSSC-(P-I)-A/2024
(For All Sessions)

Paper Code	6	1	9	7

Group-I

Time: 30 Minutes **Marks : 20**

Mathematics (Objective)

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 Four 4^{th} roots of 625 are:
(A) $\pm 4, \pm 4i$ (B) ● $\pm 5, \pm 5i$ (C) $\pm 16, \pm 16i$ (D) $\pm 25, \pm 25i$

2. Partial fractions of $\frac{x^2+1}{(x+1)(x-1)}$ are of the form:
(A) ● $\frac{A}{x+1}+\frac{B}{x-1}$ (B) $\frac{Ax}{x+1}+\frac{B}{x-1}$ (C) $1+\frac{A}{x+1}+\frac{B}{x-1}$ (D) $\frac{Ax+B}{x+1}+\frac{Cx+D}{x-1}$

3. $A.M$ between $x-3$ and $x+5$ is:
(A) ● $x+1$ (B) $x-1$ (C) $x-3$ (D) $x+5$

4. No term of a $G.P$ can be:
(A) ● 0 (B) 1 (C) -1 (D) i

5. $8.7.6 =$
(A) $\frac{8!}{8}$ (B) $\frac{8!}{7!}$ (C) $\frac{8!}{6!}$ (D) ● $\frac{8!}{5!}$

6. $4^n > 3^n + 4$ is true for integers:
(A) ● $n \geq 2$ (B) $n \geq 3$ (C) $n \geq 4$ (D) $n \geq 5$

7. If $sin\theta < 0$ and $cos\theta > 0$, then terminal arm of θ lies in quadrant:
(A) I (B) II (C) III (D) ● IV

8. $\frac{1-cos\theta}{2} =$
(A) $sin\theta$ (B) ● $sin^2\frac{\theta}{2}$ (C) $cos\,\theta$ (D) $cos^2\frac{\theta}{2}$

9. Range of $y = tanx$ is:
(A) $\frac{-\pi}{2} \leq y \leq \frac{\pi}{2}$ (B) ● $-\infty < y < \infty$ (C) $\frac{-\pi}{2} \leq x \leq \frac{\pi}{2}$ (D) $-\infty < x < \infty$

10. $2\mathcal{R}\,sin \propto =$
(A) r (B) S (C) Δ (D) ● a

11. $Sin\left(cos^{-1}\frac{\sqrt{3}}{2}\right) =$
(A) ● $\frac{1}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{\sqrt{3}}$ (D) 1

12. Reference Angle for $1 - 2\,sinx = 0$ is:
(A) ● $\frac{\pi}{6}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$

13. $\forall z \in C$, which one is true:
(A) $z = -z$ (B) $\bar{z} = -z$ (C) ● $\bar{\bar{z}} = z$ (D) $\bar{\bar{z}} = -z$

14. A prime number can be factor of a square only if it occurs in it at least.
(A) Once (B) ● Twice (C) Thrice (D) Four times

15. If A and B are disjoint sets, then $A - B =$
(A) B (B) ● A (C) $B - A$ (D) ϕ

16. The converse of $\sim p \rightarrow q$ is:
(A) ● $q \rightarrow \sim p$ (B) $p \rightarrow q$ (C) $q \rightarrow p$ (D) $p \rightarrow \sim q$

17. $p \wedge q$ is called:
(A) ● Conjunction (B) Disjunction (C) Conditional (D) Equivalence

18. $(AB)^t =$
(A) A^tB^t (B) A^tB (C) AB (D) ● B^tA^t

19. A square matrix A is anti-symmetric if:
(A) ● $A^t = -A$ (B) $A^t = A$ (C) $\bar{A} = A$ (D) $\bar{A} = -A$

20. $1 + \omega + \omega^2 =$
(A) 1 (B) ω (C) ω^2 (D) ● 0

Roll No _____

HSSC-(P-I)-A/2024
(For All Sessions)

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Marks

Time: 2:30 hours

Mathematics (Subjective)

(GROUP-I)

SECTION-I

(8x2=16)

2. Write short answers of any eight parts from the following:

i. Define a complex number. Is 0 a complex number?

ii. Whether the set $\{0, -1\}$ is closed or not $w.r.t$ addition and multiplication.

iii. Factorize: $3x^2 + 3y^2$

iv. Find multiplicative inverse of $-3 - 5i$

v. Construct truth table of $\sim(p \to q) \to p$

vi. Define monoid.

vii. Find the matrix X if: $X\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 12 & 3 \end{bmatrix}$

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

ix. If $A = \begin{bmatrix} 1 \\ 1+i \\ i \end{bmatrix}$, find $A(\bar{A})^t$

x. Find four fourth roots of 81

xi. Use the remainder theorem to find the remainder when $x^3 - 2x^2 + 3x +$ _ vided by $x - 3$

xii. If $\propto, \beta$ are the roots of $3x^2 - 2x + 4 = 0$, find the value of $\frac{\propto}{\beta} + \frac{\beta}{\propto}$

(8x2=16)

3. Write short answers of any eight parts from the following:

i. Define conditional equation.

ii. Resolve $\frac{x^2+15}{(x^4+2x+5)(x-1)}$ into partial fraction without finding constants.

iii. Find the first four terms of the sequence $a_n = \frac{n}{2n+1}$

iv. Determine whether -19 is a term of $17, 13, 9, \ldots$

v. Find the 5th term of the G.P 3, 6, 12, ...

vi. Sum the series $\frac{3}{\sqrt{2}} + 2\sqrt{2} + \frac{5}{\sqrt{2}} + \cdots + a_{13}$

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

viii. Find the value of n when ${}^nC_{12} = {}^nC_6$

ix. Determine the probability of getting dots less than 5 when a die is rolled.

x. Prove that $n! > 2^n - 1$ for $n = 4, 5$

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

xii. Expand $(1 + 2x)^{-1}$ up to 4 terms.

(9x2=18)

4. Write short answers of any nine parts from the following:

i. Write values of trigonometric functions for $\theta = \frac{-9}{2}\pi$.

ii. Prove that $tan^2\theta - cos^2\theta = cot^2\theta\, cos^2\theta$.

iii. Prove that $sin(\theta + 270) = -cos\theta$.

iv. Prove that $sin2\theta = 2sin\theta\ cos\theta$.

v. Express $sin12^\circ\ sin46^\circ$ as sum or difference.

vi. Write domain and range of $cos\ x$.

vii. Find period of $sin\frac{x}{3}$.

viii. Draw the graph of $tanx$ for $x \in (0, \pi)$

ix. Prove that $r = (s - b)tan\frac{\beta}{2}$.

x. Write any two half angle formulae.

xi. When angle between ground and sun is 30°, flag pole casts a shadow of $40m$ long. Find height of top of flag.

xii. Show that $cos(sin^{-1}x) = \sqrt{1 - x^2}$.

xiii. Solve the equation $4\ cos^2x - 3 = 0$

SECTION-II

Note: **Attempt any three questions. Each question carries equal marks:** (10x3=30)

5.(a) If $\propto$ and β are the roots of $x^2 - 3x + 5 = 0$, form the equation whose roots are $\frac{1-\propto}{1+\propto}\ and\ \frac{1-\beta}{1+\beta}$.

(b) Find the rank of matrix $\begin{bmatrix} 1 & -1 & 2 & 1 \\ 2 & -6 & 5 & 1 \\ 3 & 5 & 4 & -3 \end{bmatrix}$

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

(b) Find six arithmetic means between 2 and 5.

7. (a) A die is thrown. Find the probability that the no. of dots on the top are prime numbers or odd numbers.

(b) If x is so small that its cube or higher powers can be neglected, show that $\sqrt{\frac{1-x}{1+x}} \approx 1 - x + \frac{1}{2}x^2$

8. (a) Solve the triangle ABC, given that $\propto = 35^\circ\ 17'\ \beta = 45^\circ\ 13', b = 421$.

(b) Reduce $cos^4\theta$ to an expression involving only function of multiples of θ, raised to the first power.

9. (a) A circular wire of radius $6\ cm$ is cut straightened and then bent so as to lie along the circumference of a hoop of radius $24\ cm$. Find the measure of the angle which it subtends at the center of the hoop.

(b) Prove that: $tan^{-1}\frac{1}{4} + tan^{-1}\frac{1}{5} = tan^{-1}\frac{9}{19}$

Roll No _____

HSSC-(P-I)-A/2024
(For All Sessions)

Paper Code	6	1	9	2

Mathematics (Objective)

Group-II **Time: 30 Minutes** **Marks : 20**

Note: Write Answers to the Questions on the objective answer sheet provided. Four possible answers A, B, C and D to each question are given. Which answer you consider correct, fill the corresponding circle A, B, C or D given in front of each question with Marker or Pen ink on the answer sheet provided.

1.1 A complex number $1 + i$ can also be expressed as:
(A) $2(cos45° + i\,sin45°)$ (B) $\sqrt{2}(cos45° - i\,sin45°)$ (C) ● $\sqrt{2}(cos45° + i\,sin45°)$ (D) $2(cos45° - i\,sin45°)$

2. If Z is a complex number and $Z = \overline{Z}$ then Z must be:
(A) ● Real (B) Imaginary (C) Rational (D) Irrational

3. The set $\{(a, b)\}$ is called:
(A) Infinite set (B) ● Singleton set (C) Empty set (D) Set with two elements

4. Drawing conclusion from premises believed to be true is called:
(A) Proposition (B) Contradiction (C) Induction (D) ● Deduction

5. If p is a logical statement $p \wedge \sim p$ is always:
(A) ● Absurdity (B) Contigency (C) Tautology (D) Conditional

6. If $A = [a \quad b \quad c]$, then order of A^t is:
(A) 1×3 (B) ● 3×1 (C) 3×3 (D) 1×1

7. If the matrix $\begin{bmatrix} \lambda & 1 \\ -2 & 1 \end{bmatrix}$ is singular then $\lambda =$
(A) 2 (B) 1 (C) -1 (D) ● -2

8. IF $4^{3x} = \frac{1}{2}$ then x is equal to:
(A) ● $-\frac{1}{6}$ (B) -6 (C) $\frac{1}{6}$ (D) 6

9. If ω is cube root of unity, then $\omega + \omega^2 =$
(A) 0 (B) ● -1 (C) 1 (D) $\frac{1}{\omega}$

10. From the identity $5x + 4 = A(x - 1) + B(x + 2)$, value of B is:
(A) -3 (B) ● 3 (C) -2 (D) 2

11. Which of the term cannot be a term of G.P:
(A) -1 (B) 1 (C) ● 0 (D) 5

12. $\sum_{k=1}^{n} K$ *is equal to:*
(A) $\frac{n+1}{2}$ (B) ● $\frac{n(n+1)}{2}$ (C) $\frac{n(n+1)(2n+1)}{6}$ (D) $\frac{n(n-1)}{2}$

13. $\frac{{}^{n}P_r}{r!}$ *is equal to:*
(A) ● ${}^{n}C_r$ (B) ${}^{n}C_{r-1}$ (C) ${}^{n+1}C_r$ (D) ${}^{n-1}C_r$

14. In expansion of $(a + b)^{16}$ middle term will be:
(A) $11th$ (B) $12th$ (C) $8th$ (D) ● $9th$

15. Which of the following is **NOT** Quadrantal angle?
(A) $\frac{9}{2}\pi$ (B) 13π (C) ● $\frac{4}{3}\pi$ (D) $\frac{\pi}{2}$

16. The angle $\frac{3\pi}{2} - \theta$ lies in quadrant:
(A) I (B) II (C) ● III (D) IV

17. The range of $sinx$ is:
(A) ● $[-1, 1]$ (B) $[-1, 0]$ (C) $[0, 2]$ (D) $[-2, 2]$

18. The radius of inscribed circle is:
(A) $\frac{abc}{4\Delta}$ (B) $\frac{S}{\Delta}$ (C) $\frac{\Delta}{S-a}$ (D) ● $\frac{\Delta}{S}$

19. $Cos\left(sin^{-1}\frac{1}{\sqrt{2}}\right)$ is equal to:
(A) $\frac{1}{2}$ (B) $\frac{\pi}{4}$ (C) ● $\frac{1}{\sqrt{2}}$ (D) $-\frac{\pi}{4}$

20. If $sinx = \frac{1}{2}$, then reference angle is:
(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$ (C) $-\frac{\pi}{6}$ (D) ● $\frac{\pi}{6}$

Roll No _____ to be filled in by the candidate

HSSC-(P-I)-A/2024
(For All Sessions)
(GROUP-II)

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Marks : 80
Time: 2:30 hours

Mathematics (Subjective)

SECTION-I

2. Write short answers of any eight parts from the following: (8x2=16)

i. Does the set $\{1, -1)$ possess closure property $w.r.t$ multiplication? Construct the multiplication table.

ii. If $\frac{a}{b} = \frac{c}{d}$, prove that $ad = bc$

iii. Factorize $a^2 + 4b^2$

iv. Simplify by expressing in the form $a + bi$: $(2 + \sqrt{-3})(3 + \sqrt{-3})$

v. If $B = \{1, 2, 3\}$ then write down the power set of B

vi. Determine whether the statement $p \rightarrow (q \rightarrow p)$ is a tautology or not.

vii. Under what conditions, the determinant of a square matrix A is zero. Write any two conditions.

viii. If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, find the values of a and b.

ix. Determine whether the matrix $A = \begin{bmatrix} 1 & 1+i \\ 1-i & 2 \end{bmatrix}$ is hermitian matrix or skew-hermitian matrix.

x. Solve the equation: $x^{-2} - 10 = 3x^{-1}$

xi. Find four fourth roots of 16.

xii. Show that the roots of equation will be rational $px^2 - (p-q)x - q = 0$

3. Write short answers of any eight parts from the following: (8x2=16)

i. Define an identity with example.

ii. Resolve into partial fraction $\frac{1}{x^2-1}$

iii. The $7th$ and $10th$ terms of an H.P are $\frac{1}{3}$ and $\frac{5}{21}$ respectively, find its $14th$ term.

iv. Find the sum of first 15 terms of geometric sequence $1, \frac{1}{3}, \frac{1}{9}, \ldots\ldots$

v. Insert two G.M's between 2 and 16.

vi. How many terms of the series $-7 + (-5) + (-3) + \cdots$ amount to 65

vii. A card in drawn from a deck of 52 playing cards What is the probability that it is a diamond card or an ace?

viii. Find n, if ${}^nC_8 = {}^nC_{12}$

ix. How many different 4-digit numbers can be formed out of the digits 1, 2, 3, 4, 5, 6, when no digit is repeated?

x. Use mathematical induction to prove that $3 + 3.5 + 3.5^2 + \cdots + 3.5^n = \frac{3(5^{n+1}-1)}{4}$ for $n = 1,2$

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

xii. Expand upto 4 – terms $(1-x)^{1/2}$

4. Write short answers of any nine parts from the following: (9x2=18)

i. Find r, when $l = 56cm, \theta = 45°$

ii. Verify that $sin2\theta = 2sin\theta cos\theta$ for $\theta = 45°$

iii. Write the fundamental law of trigonometry.

iv. Show that $cos(\propto +\beta)\cos(\propto -\beta) = cos^2 \propto -sin^2\beta$.

v. Express $sin5x + sin7x$ as a product.

vi. Define the period of trigonometric function.

vii. Write down the domain and range of tangent function.

viii. Find the period of $sin\frac{x}{3}$

ix. Solve the right triangle ABC, in which $\gamma = 90°, a = 3.28,\ b = 5.74$.

x. Define half angle formulas for tangent.

xi. Define Hero's formula.

xii. Find the value of $sin(tan^{-1}(-1))$

xiii. Solve the equation $sin2x = cosx$ where $x \in [0, 2\pi]$

SECTION-II

Note: **Attempt any three questions. Each question carries equal marks:** (10x3=30)

5.(a) Show that $\begin{vmatrix} x & 1 & 1 & 1 \\ 1 & x & 1 & 1 \\ 1 & 1 & x & 1 \\ 1 & 1 & 1 & x \end{vmatrix} = (x+3)(x-1)^3$

(b) Prove that $\frac{x^2}{a^2} + \frac{(mx+c)^2}{b^2} = 1$ will have equal roots if $c^2 = a^2m^2 + b^2;\ a \neq 0, b \neq 0$

6. (a) Resolve into partial fractions $\frac{6x^3+5x^2-7}{2x^2-x-1}$

(b) The $A.M$ between the two numbers is 5 and their positive $G.M.$ is 4 find the numbers.

7. (a) Prove that ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

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

8. (a) Reduce $sin^4\theta$ to an expression involving only functions of multiples of θ raised to the first power.

(b) With usual notations, prove that $r = s.\tan{}^{\propto}/_2 . tan{}^{\beta}/_2 . tan{}^{\gamma}/_2$

9. (a) If $cot\theta = \frac{5}{2}$, and θ is in quadrant I find the value of $\frac{3sin\theta+4cos\theta}{cos\theta-sin\theta}$

(b) Prove that $cos^{-1}\frac{63}{65} + 2tan^{-1}\frac{1}{5} = sin^{-1}\frac{3}{5}$

1124 Warning:- Please write your Roll No. in the space provided and sign. Roll No----------

(Inter Part – I) **(Session 2020-22 to 2023-25)** **Sig. of Student ----------**

Mathematics (Objective) **Group I** **Paper (I)**

Time Allowed:- 30 minutes **PAPER CODE 2191** **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 circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper, on** the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) The modulus of Complex number $4 + 5i$ *is*

(A) $\sqrt{41}$ ● (B) $-\sqrt{41}$ (C) $\sqrt{31}$ (D) $-\sqrt{31}$

2) Multiplicative inverse of $(2, 0)$ is

(A) $\left(\frac{1}{2}, 0\right)$ ● (B) $\left(\frac{1}{2}, -2\right)$ (C) $\left(\frac{1}{4}, 0\right)$ (D) $\left(-\frac{1}{4}, 0\right)$

3) If $A \subseteq B$, then $A \cap B$ equals

(A) B (B) A ● (C) A' (D) B'

4) Disjunction of two Logical statements p and q is

(A) $p \cup q$ (B) $p \wedge q$ (C) $p \vee q$ ● (D) $p \cap q$

5) The solution of linear equation $ax = b$ *where* $a, b \in G$ is

(A) $x = ab$ (B) $x = ab^{-1}$ (C) $x = a^{-1}b^{-1}$ (D) $x = a^{-1}b$ ●

6) If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$, then A_{23} will be

(A) 1 (B) 3 (C) -2 ● (D) 2

7) For square matrix A, if $A^t = A$, then A is called

(A) Symmetric Matrix ● (B) Skew Symmetric Matrix (C) Skew Hermitian (D) Hermitian Matrix

8) The product of four fourth root of unity is

(A) 1 (B) -1 ● (C) 0 (D) 4

9) If α and β are roots of $7x^2 - x - 2 = 0$, then $\alpha + \beta$ will be

(A) $-\frac{1}{7}$ (B) $\frac{1}{7}$ ● (C) $\frac{2}{7}$ (D) $-\frac{2}{7}$

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10) Rational fraction $\frac{x^2+2x+3}{Q(x)}$ will be improper fraction if degree of $Q(x)$ is

(A) 3 (B) 4 (C) 2 ● (D) 5

11) If in an A.P. $a_1 = 11$, $a_n = 68$, $d = 3$, then n will be equal to

(A) 30 (B) -20 (C) -30 (D) 20 ●

12) If 3,9,27,... are in G.P. then r =

(A) 1 (B) 2 (C) 4 (D) 3 ●

13) The probability of non-occurrence of event E is

(A) 1+P(E) (B) 1-P(E) ● (C) $1+P(\bar{E})$ (D) P(E)-1

14) The expansion $(1-3x)^{1/2}$ will be valid if

(A) $|x| < \frac{-1}{3}$ (B) $|x| < 3$ (C) $|x| < \frac{1}{3}$ ● (D) $|x| < -3$

15) If $\cot\theta = 5/2$; $0 < \theta < \frac{\pi}{2}$, then $\operatorname{cosec}^2\theta$ is

(A) $\frac{-29}{4}$ (B) $\frac{4}{29}$ (C) $\frac{29}{4}$ ● (D) $\frac{-4}{29}$

16) $\sin(\theta + 270^o) =$

(A) $\sin\theta$ (B) $-\sin\theta$ (C) $\cos\theta$ (D) $-\cos\theta$ ●

17) Period of $\sin\frac{x}{3}$ is

(A) 6π ● (B) 3π (C) -6π (D) -3π

18) $\frac{4\Delta}{abc} =$

(A) $\frac{1}{R}$ ● (B) $\frac{1}{r}$ (C) R (D) r

19) $\cos(2\sin^{-1}x)$ will be equal to:

(A) $2x^2-1$ (B) $1+2x^2$ (C) $2x+1$ (D) $1-2x^2$ ●

20) Reference angle always lies in quadrant

(A) II (B) I ● (C) III (D) IV

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1124 Warning:- Please, do not write anything on this question paper except your Roll No.

Mathematics (Subjective) **(Session 2020-22to 2023-25)** **Paper (I)**

Time Allowed: 2.30 hours **(Inter Part - I) Group I** **Maximum Marks: 80**

Section ---------- I

2. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Prove that $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$

(ii) Find the multiplicative inverse of (-4 , 7) **(iii)** Factorize $9a^2+16b^2$

(iv) Prove that product of any two conjugate complex numbers is a real number.

(v) Show that $A-B\subseteq A\cap B'$

(vi) Let $(G,\cdot)$ be a group and $a, b \in G$, then prove that $(a\cdot b)^{-1}=b^{-1}\cdot a^{-1}$

(vii) If $A=\begin{bmatrix}1 & -2 & 3\\ -2 & 3 & 1\\ 4 & -3 & 2\end{bmatrix}$, then find A_{12} and A_{22}

(viii) Given A and B are two non singular matrices, show that $(AB)^{-1}=B^{-1}A^{-1}$

(ix) If $A=\begin{bmatrix}i & 1+i\\ 1 & -i\end{bmatrix}$, then find $A-(\overline{A})'$ **(x)** Find the fourth roots of unity.

(xi) When x^3+2x^2+kx+4 is divided by $x-2$, then remainder is 14. Find value of k

(xii) Show that the roots of equation $x^2-2\left(m+\frac{1}{m}\right)x+3=0$ are real where $m\neq 0$

3. Answer briefly any Eight parts from the followings:- **8 × 2 = 16**

(i) Resolve $\frac{x^2+1}{(x-1)(x+1)}$ into partial fraction **(ii)** Define conditional equation.

(iii) Determine whether -19 is term of A.P 17,13,9,... **(iv)** Find geometric mean between $-2i$ and $8i$

(v) Sum the infinite geometric series $4+2\sqrt{2}+2+\sqrt{2}+\ldots$

(vi) Find 12^{th} term of H.P $\frac{1}{3},\frac{2}{9},\frac{1}{6},\ldots$ **(vii)** Evaluate ${}^{10}p_7$

(viii) How many ways can 4 keys be arranged on a circular key ring.

(ix) How many diagonals can be formed by joining vertices of 5 sided figure

(x) Expand $\left(x-1-\frac{1}{x}\right)^3$ **(xi)** Expand upto four terms $(1+x)^{-3}$

(xii) Find term involving x^5 in expansion of $\left(x^2-\frac{3}{2x}\right)^{10}$

4. Answer briefly any Nine parts from the followings:- **9 × 2 = 18**

(i) Express 75° in radians.

(ii) Prove that $\frac{\sin\theta}{1+\cos\theta} + \cot\theta = \operatorname{cosec}\theta$

(iii) If α, β, γ are angles of a triangle, then prove that $\cos\left(\frac{\alpha+\beta}{2}\right) = \sin\frac{\gamma}{2}$

(iv) Without using calculator, find the value of $\tan 105^\circ$

(v) Prove that $\frac{1-\cos\alpha}{\sin\alpha} = \tan\frac{\alpha}{2}$

(vi) Write the domain and range of $y = \cos x$

(vii) Define periodicity.

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

(ix) At the top of a cliff 80 m high, the angle of depression of a boat is 12°. How far is the boat from the cliff?

(x) Find area of a triangle ABC in which a = 18 , b = 24 , c = 30

(xi) Show that $r_2 = s\tan\frac{\beta}{2}$

(xii) Show that $\cos(\sin^{-1} x) = \sqrt{1-x^2}$

(xiii) Solve the equation $1+\cos x = 0$ for general solution.

Section ---------- II **(10 × 3 = 30)**

Note: Attempt any three questions.

5. (a) Find the inverse of the matrix $A = \begin{bmatrix} 2 & 5 & 1 \\ 3 & 4 & 2 \\ 1 & 2 & -2 \end{bmatrix}$

(b) Solve the system of equations $y^2 - 7 = 2xy$, $2x^2 + 3 = xy$

6. (a) Resolve $\frac{x^4}{1-x^4}$ into Partial Fractions.

(b) The A.M of two positive integral numbers exceeds their (positive) G.M by 2 and their sum is 20, find the numbers.

7. (a) Prove that ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^nC_r$

(b) If $y = \frac{1}{3} + \frac{1.3}{2!}\left(\frac{1}{3}\right)^2 + \frac{1.3.5}{3!}\left(\frac{1}{3}\right)^3 + \ldots$ then prove that $y^2 + 2y - 2 = 0$

8. (a) Reduce $\cos^4\theta$ to an expression involving only function of multiples of θ, raised to the first power.

(b) Prove that $r_1 + r_2 + r_3 - r = 4R$

9 (a) Prove that $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$, where θ is not an odd multiple of $\frac{\pi}{2}$

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

1124 Warning:- Please write your Roll No. in the space provided and sign. Roll No----------

(Inter Part – I) (Session 2020-22 to 2023-25) Sig. of Student ----------

Mathematics (Objective) (Group-II) Paper (I)

Time Allowed:- 30 minutes PAPER CODE 2198 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 circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Write **PAPER CODE, which is printed on this question paper, on** the both sides of the Answer Sheet and fill bubbles accordingly, otherwise the student will be responsible for the situation. Use of Ink Remover or white correcting fluid is not allowed.

Q. 1

1) The transpose of a rectangular matrix is a

(A) Square matrix (B) Diagonal matrix (C) Rectangular matrix (D) Scalar matrix

2) $1-\omega+\omega^2 =$

(A) -1 (B) 0 (C) $-\omega$ (D) -2ω

3) The quadratic equation with roots $3-\sqrt{3}$, $3+\sqrt{3}$ is

(A) $x^2+4x+1=0$ (B) $x^2-4x+1=0$ (C) $x^2-6x+6=0$ (D) $x^2-6x-6=0$

4) The reflexive property of equality of real numbers is that $\forall\ a \in \mathbb{R}$

(A) $a=a$ (B) $a\neq a$ (C) $a<a$ (D) $a>a$

5) $|Z|^2 =$

(A) Z^2 (B) $Z\bar{Z}$ (C) $\bar{Z}^2$ (D) Z

6) $\{x \mid x \in N,\ x \leq 10\}$ is the

(A) Discriptive method (B) Tabular method (C) Set builder method (D) Non-discriptive method

7) p : $4<7$, q : $6>11$, the disjunction $p \vee q$ is

(A) False (B) True (C) Not valid (D) unknown

8) The identity element of a set X with respect to intersection in P(X) is

(A) 0 (B) ϕ (C) Does not exist (D) X

9) If $A=\begin{bmatrix} x & 1 \\ 1 & 1 \end{bmatrix}$ and $\frac{1}{|A|}=7$, then $x =$

(A) $\frac{8}{7}$ (B) $\frac{7}{8}$ (C) $\frac{9}{7}$ (D) 7

P.T.O 1127 -- 1124 -- 11000 (4)

10) $r_1 r_2 r_3 =$

(A) Rr^2 (B) rR^2 (C) RS^2 (D) YS^2 ●

11) $2\cos^{-1} A =$

(A) $\sin^{-1}\{2A^2-1\}$ (B) $\sin^{-1}\{A^2-2\}$ (C) $\cos^{-1}\{2A^2-1\}$ ● (D) $\cos^{-1}\{A^2-2\}$

12) $\cos x = -\frac{1}{\sqrt{2}}$ and $x \in [0,\pi]$ then $x =$

(A) $\frac{3\pi}{4}$ (B) $\frac{5\pi}{4}$ (C) $\frac{\pi}{4}$ ● (D) $\frac{-\pi}{4}$

13) $(x-4)^2 = x^2 - 8x + 16$ is

(A) A linear equation (B) Cubic equation (C) An equation (D) An identity ●

14) A number A is said to be the arithmatic mean between two numbers a and b if a , A , b is

(A) G.P (B) A.P ● (C) H.P (D) Not a sequence

15) If a = 3 , r = 2 then nth term of the G.P is

(A) 3.2^{n-1} ● (B) 2.3^{n-1} (C) 3.2^n (D) 3.2^{n+1}

16) $n(n-1)(n-2)(n-3)\ldots(n-r+1) =$

(A) $n!r!$ (B) $\frac{n!}{r!}$ (C) $\frac{n!}{(n-r)!}$ ● (D) $n!$

17) The sum of the odd coefficients in the expansion $(1+x)^3$ is

(A) 4 ● (B) 8 (C) 12 (D) 16

18) $120^\circ =$ _____ radians

(A) $\frac{3\pi}{2}$ (B) $\frac{2\pi}{3}$ ● (C) $\frac{\pi}{2}$ (D) 180π

19) $2\sin^2\left(\frac{\alpha}{2}\right) =$

(A) $1+\sin\alpha$ (B) $1-\sin\alpha$ (C) $1+\cos\alpha$ (D) $1-\cos\alpha$ ●

20) The range of $\sin x$ is

(A) [-1 , 1] ● (B)]-1 , 1[(C) $\mathbb{R}$ (D)]-1 , 1]

1127 -- 1124 -- 11000 (4)

1124 Warning:- Please, do not write anything on this question paper except your Roll No.

Mathematics (Subjective) (Session 2020-22 to 2023-25) Paper (I)

Time Allowed: 2.30 hours (Inter Part - I) (Group-II) Maximum Marks: 80

Section ---------- I

2. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Prove the rule of addition $\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}$

(ii) Separate real and imaginary parts $\frac{2-7i}{4+5i}$ **(iii)** Find the multiplicative inverse of $-3-5i$

(iv) For any complex number $z \in C$, prove that $z \cdot \bar{z} = |z|^2$

(v) If S = {0 , 1 , 2} , then show that S is an abelian group under addition.

(vi) Construct the truth table of the statement $(p \wedge \sim p) \longrightarrow q$

(vii) If $B=\begin{bmatrix} 5 & -2 & 5 \\ 3 & -1 & 4 \\ -2 & 1 & -2 \end{bmatrix}$, then find B_{21} and B_{23}.

(viii) If A is symmetric or skew-symmetric, show that A^2 is symmetric

(ix) Find the matrix X if $X\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix}=\begin{bmatrix} -1 & 5 \\ 12 & 3 \end{bmatrix}$

(x) Show that the product of all the three cube roots of unity is unity.

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

(xii) Solve the equation $x^4 - 6x^2 + 8 = 0$

3. Answer briefly any Eight parts from the followings:- 8 × 2 = 16

(i) Define a Rational Fraction with example.

(ii) Resolve into partial Fraction without determining the constants $\frac{3x^2-4x-5}{(x-2)(x^2+7x+10)}$

(iii) If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in A.P , show that $b=\frac{2ac}{a+c}$ **(iv)** If $S_n = n(2n+1)$, then find the series

(v) A.M between two numbers is 5 and their positive G.M is 4. Find the numbers.

(vi) If 5 is Harmonic Mean between 2 and b. Find b **(vii)** Find the value of n, when ${}^{n}P_4 : {}^{n-1}P_3 = 9 : 1$

(viii) A die is rolled, what is the probability that the top shows dot 3 or 4.

(ix) Find the number of the diagonals of a 6 – sided figure. **(x)** State the principle of Mathematical induction.

(xi) Prove the formula 2+4+6+...2n = n(n+1) **(xii)** Find the general term of $\left(\frac{a}{2}-\frac{2}{a}\right)^6$

4. **Answer briefly any Nine parts from the followings:-** $9 \times 2 = 18$

(i) State fundamental identities. **(ii)** Verify that $\sin^2\frac{\pi}{6} : \sin^2\frac{\pi}{4} : \sin^2\frac{\pi}{3} : \sin^2\frac{\pi}{2} = 1:2:3:4$

(iii) Prove that $\cos 330^o \sin 600^o + \cos 120^o \sin 150^o = -1$

(iv) Show that $\cot(\alpha+\beta) = \dfrac{\cot\alpha\cot\beta - 1}{\cot\alpha + \cot\beta}$ **(v)** Prove that $\sin(\alpha+\beta) - \sin(\alpha-\beta) = 2\cos\alpha\sin\beta$

(vi) Write down the Domain and Range of secant function. **(vii)** Find the period of $\tan 4x$

(viii) Draw the graph of $y = \sin x$ from 0 to π

(ix) Define the angles of elevation and depression. **(x)** What do you mean by oblique triangle.

(xi) By using law of cosine, find α when $a = 7$, $b = 3$, $c = 5$

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

(xiii) Solve the trigonometric equation $\cot^2\theta = \dfrac{1}{3}$

Section ---------- II

Note: Attempt any three questions. **(10 × 3 = 30)**

5. **(a)** Use Crammer's Rule to solve the systems of Linear equations

$$\left.\begin{aligned} 3x_1 + x_2 - x_3 &= -4 \\ x_1 + x_2 - 2x_3 &= -4 \\ -x_1 + 2x_2 - x_3 &= 1 \end{aligned}\right\}$$

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

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

(b) How many terms of the series -9 -6 -3 + 0 + ... amount to 66?

7. **(a)** Find values of n and r when ${}^{n-1}C_{r-1} : {}^{n}C_{r} : {}^{n+1}C_{r+1} = 3:6:11$

(b) If $2y = \dfrac{1}{2^2} + \dfrac{1.3}{2!}\dfrac{1}{2^4} + \dfrac{1.3.5}{3!}\dfrac{1}{2^6} + \ldots$ *then prove that* $4y^2 + 4y - 1 = 0$

8. **(a)** Prove that $\sin 10^o \cdot \sin 30^o \cdot \sin 50^o \cdot \sin 70^o = \dfrac{1}{16}$

(b) Using Law of tangents, solve the ΔABC in which $a = 36.21$; $c = 30.14$; $\beta = 78^o 10'$

9 **(a)** If $\operatorname{cosec}\theta = \dfrac{m^2+1}{2m}$; $m > 0$; $0 < \theta < \pi/2$, then find the values of remaining trigonometric functions.

(b) Prove that $2\tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{7}\right) = \pi/4$

1128 -- 1124 -- 11000

Mathematics	(C)	L.K.No.1534	Paper Code No. 6195
Paper I	(Objective Type)	Ist – A – Exam – 2024	Session (2022 – 24) & (2023 – 25)
Time :	30 Minutes	Inter (Part - I)	Marks : 20

Note : Four choices A , B , C ,D to each question are given. Which choice is correct fill that circle in front of that Question No. on the Objective Bubble Sheet. Use Marker or Pen to fill the circles. Cutting or filling two or more circles will result in Zero Mark in that Question.

Q.No.1 (1)	If $A \subseteq B$ and $A - B = \emptyset$, then $n(A - B) =$ ..... : (A) 0 (B) n(A) (C) n(B) (D) n(A) – n(B)
(2)	The Property $\forall\ a \in R$, $a = a$ is called : (A) Symmetric (B) Transitive (C) Reflexive (D) Commutative
(3)	Modulus of $5 - 3i$ is : (A) $\sqrt{4}$ (B) $\sqrt{16}$ (C) $\sqrt{25}$ (D) $\sqrt{34}$
(4)	If p is a logical statement then $p \wedge \sim p$ is always : (A) Absurdity (B) Contigency (C) Tautology (D) Conditional
(5)	If $A = \begin{bmatrix} 1 & 1 \\ 1 & x \end{bmatrix}$, and $\lvert A \rvert = 4$, then x = ... : (A) 2 (B) 3 (C) 4 (D) 5
(6)	A matrix of order m x 1 is called : (A) Row Matrix (B) Column Matrix (C) Diagonal Matrix (D) Null Matrix
(7)	Set containing elements of A or B is denoted by : (A) $A \cap B$ (B) $A \subseteq B$ (C) $A \cup B$ (D) $B \subseteq A$
(8)	Roots of the equation $x^2 - 5x + 6 = 0$ are ..... : (A) 2 , – 3 (B) –2 , – 3 (C) 2 , 3 (D) – 2 , 3
(9)	The Arithmetic Mean between $\sqrt{2}$ and $3\sqrt{2}$ is : (A) $2\sqrt{2}$ (B) $3\sqrt{2}$ (C) $4\sqrt{2}$ (D) $\sqrt{2}$
(10)	$\frac{x}{2x+3}$ is ..... : (A) Proper Fraction (B) Improper Fraction (C) Identity Fraction (D) Mixed Fraction
(11)	Degree of Constant Polynomial is : (A) n (B) 2 (C) 1 (D) 0
(12)	$\sum_{K=1}^{n} K =$ ..... (A) $\frac{n^2(n+1)^2}{4}$ (B) $\frac{n(n+1)}{2}$ (C) $\frac{n(n+1)(n+2)}{6}$ (D) $\frac{n(n-1)}{2}$
(13)	Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in quad III is ..... : (A) $\frac{5\pi}{3}$ (B) $\frac{7\pi}{6}$ (C) $\frac{4\pi}{3}$ (D) $\frac{7\pi}{3}$
(14)	Numbers of terms in the expansion of $(a + x)^{2n+1}$ are : (A) 2n + 2 (B) 2n +1 (C) 2n (D) n + 1
(15)	Probability of an impossible event is ..... : (A) 1 (B) 0 . 5 (C) 0 . 25 (D) 0
(16)	$\tan(\alpha - 90^\circ)$ = ... : (A) $\cot\alpha$ (B) $-\cot\alpha$ (C) $\tan\alpha$ (D) $-\tan\alpha$
(17)	The Value of $\sin^{-1}(\cos\frac{\pi}{6})$ is equal to : (A) $\pi/2$ (B) $3\pi/2$ (C) $\pi/6$ (D) $\pi/3$
(18)	$\sec\left(\frac{\alpha}{2}\right)$ = ... : (A) $\sqrt{\frac{s(s-a)}{bc}}$ (B) $\sqrt{\frac{bc}{s(s-a)}}$ (C) $\frac{s}{\Delta}$ (D) $\frac{\Delta}{s-b}$
(19)	Period of Cot 3x is ..... : (A) π (B) $\frac{2\pi}{3}$ (C) $\frac{\pi}{2}$ (D) $\frac{\pi}{3}$
(20)	If $\sin x = \frac{\sqrt{3}}{2}$ and $x \in [0, 2\pi]$, then x is : (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) $\frac{\pi}{6}, \frac{5\pi}{6}$

Roll No.	1534 -) .6006 Inter (Part - I)	Session (2022 -24) & (2023 - 25)
Mathematics (Subjective)	Ist - A - Exam - 2024	Time 2 : 30 Hours Marks : 80

Note: It is compulsory to attempt any (8 - 8) Parts each from Q.No. 2 and Q.No.3 while attempt any (9) Parts from Q.No.4. Attempt any (3) Questions from Part - II .Write same Question No. and its Part No. as given in the Question Paper.

Bahawalpur Board-2024

Part - I

25 x 2 = 50

Q.No.2	(i)	Show that $\forall z \in C$, $z\bar{z} = \lvert z \rvert^2$		
	(ii)	Show that $\forall z_1, z_2 \in C$, $\overline{z_1 z_2} = \bar{z}_1 \bar{z}_2$		
	(iii)	Define Polar form of a Complex Number .		
	(iv)	Prove that $\bar{z} = z$ iff z is real .		
	(v)	Write down the Power set of $\{a, \{b, c\}\}$		
	(vi)	Show that $(p \wedge q) \rightarrow p$ is a tautology .		
	(vii)	Solve the system of linear equations : $4x_1 + 3x_2 = 5$, $3x_1 - x_2 = 7$	(viii)	Write any two Properties of Determinant .
	(ix)	Define Hermitian Matrix .	(x)	Solve the equation by Completing Square $x^2 + 4x - 1085 = 0$
	(xi)	Solve the equation by using quadratic formula , $16x^2 + 8x + 1 = 0$	(xii)	Prove that : $(-1 + \sqrt{-3})^4 + (-1 - \sqrt{-3})^4 = -16$
Q.No.3	(i)	Define Conditional equation and give example .		
	(ii)	Resolve $\frac{1}{x^2 - 1}$ into Partial Fraction .		
	(iii)	If $a_{n-2} = 3n - 11$, find the nth term of the Sequence .		
	(iv)	Find A.M between $3\sqrt{5}$ and $5\sqrt{5}$		
	(v)	If $S_n = n(2n - 1)$, then find the series .		
	(vi)	With usual notation , show that $G^2 = AH$		
	(vii)	Write $n(n-1)(n-2) \ldots (n-r+1)$ in the factorial form.	(viii)	What is the Fundamental Principle of Counting?
	(ix)	Two Coins are tossed twice each. Find the Probability that the head appears on the first toss and the same faces appear in the two tosses.	(x)	Calculate $(0.97)^3$ by means of Binomial Theorem.
	(xi)	Find the term involving x^4 in the expression of $(3 - 2x)^7$	(xii)	Expand upto 4 terms , taking the values of x such that the expansion in case is valid for $(1 - x)^{\frac{1}{2}}$
Q.No.4	(i)	Convert $\frac{9\pi}{5}$ into the measure of Sexagesimal System .		
	(ii)	If $\tan\theta = \frac{8}{15}$ and $\theta \in$ III then find $\sin\theta$ and $\cos\theta$.		
	(iii)	If α, β, γ be the angles of a triangle , then prove $\tan(\alpha + \beta) + \tan\gamma = 0$		

	(iv)	Find the Value of $\tan(105^\circ)$.
	(v)	Write Triple angle identity for $\cos 3\alpha$.
	(vi)	Find the Period of $\tan\theta$.
	(vii)	Find the Period of $\sin\left(\frac{x}{3}\right)$.
	(viii)	Draw the graph of $y = 2\cos x, x \in [0, 2\pi]$
	(ix)	Solve the right triangle ABC in which $\gamma = 90^\circ$, $\alpha = 37^\circ 20'$, $a = 243$
	(x)	Define Angle of Depression.
	(xi)	By using Law of Cosine find the value of C if $a = \sqrt{3} - 1$, $b = \sqrt{3} + 1$, $\gamma = 60^\circ$
	(xii)	Find the value of $\cos(\sin^{-1}(\frac{1}{\sqrt{2}}))$
	(xiii)	Solve the equation $1 + \cos x = 0$

Part - II **3 x 10 = 30**

Q.No.5	(a)	Show that $\begin{vmatrix} a+l & a & a \\ a & a+l & a \\ a & a & a+l \end{vmatrix} = l^2(3a + l)$	(5)
	(b)	Solve the Equation : $\sqrt{5x^2 + 7x + 2} - \sqrt{4x^2 + 7x + 18} = x - 4$	(5)
Q.No.6	(a)	Resolve $\frac{x^2+1}{x^3+1}$ into Partial Fractions.	(5)
	(b)	If the numbers 1, 4 and 3 are Subtracted from three Consecutive terms of an A.P, the resulting numbers are in G.P. Find the numbers if their Sum is 21.	(5)
Q.No.7	(a)	Find the values of n and r When ${}^nC_r = 35$, and ${}^nP_r = 210$	(5)
	(b)	Use Binomial Theorem to show that $1 + \frac{1}{4} + \frac{1.3}{4.8} + \frac{1.3.5}{4.8.12} + \ldots\ldots = \sqrt{2}$	(5)
Q.No.8	(a)	Prove that $\sin^6\theta - \cos^6\theta = (\sin^2\theta - \cos^2\theta)(1 - 3\sin^2\theta\cos^2\theta)$	(5)
	(b)	Prove that : $\sin^{-1}\frac{1}{\sqrt{5}} + \cot^{-1}3 = \frac{\pi}{4}$	(5)
Q.No.9	(a)	Reduce $\sin^4\theta$ to an expression involving only function of multiples of θ, raised to the first power.	(5)
	(b)	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°.	(5)

09-05-2024

MATHEMATICS	PAPER CODE – 6197	TIME : 30 MINUTES
GROUP : FIRST	11th CLASS – 1st Annual 2024	MARKS : 20
	OBJECTIVE	

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 circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question.

QUESTION NO. 1

1 Factorial form of (n+1) (n) (n-1) is

(A) $\frac{(n+1)!}{(n-2)!}$ ● (B) $\frac{(n-2)!}{(n+1)!}$ (C) $\frac{(n+1)!}{n!}$ (D) $\frac{n!}{(n+1)!}$

2 $(2+i)^2-(2-i)^2$ = ----------

(A) $4i$ (B) $8i$ ● (C) $6i$ (D) $10i$

3 Value of $\sin^2 \pi/4 + \cos^2 \pi/4$ = ----------

(A) 0 (B) -1 (C) 1 ● (D) $\frac{1}{\sqrt{2}}$

4 Sec $(\pi/2-\theta)$ = ----------

(A) - sec θ (B) - cosec θ (C) sec θ (D) cosec θ ●

5 Period of cosec x is ----------

(A) 2π ● (B) π (C) 3π (D) $\pi/2$

6 Radius of escribed circle opposite to vertex A of triangle is ----------

(A) $\frac{\Delta}{s}$ (B) $\frac{\Delta}{s-a}$ ● (C) $\frac{\Delta}{s-b}$ (D) $\frac{\Delta}{s-c}$

7 Cos $x = \frac{1}{2}$, then x = ----------

(A) $\pi/6$ (B) $\pi/4$ (C) $\pi/3$ ● (D) $\pi/2$

8 Sin $(\text{Cos}^{-1}\sqrt{3}/2)$ = ----------

(A) $\pi/6$ (B) $\pi/3$ (C) $\frac{2}{\sqrt{3}}$ (D) ½ ●

9 1 is not ---------- number

(A) Odd (B) Real (C) Prime ● (D) Rational

10 Multiplicative inverse of complex number (0,1)

(A) (0 , -1) ● (B) (-1 , 0) (C) (1 , 0) (D) (0 , 1)

11 Set G is closed and associative with respect to binary operation, then set G is called

(A) Groupoid (B) Semi-Group ● (C) Monoid (D) Group

12 Disjunction of two statements p and q is

(A) $p \wedge q$ (B) $p \vee q$ ● (C) $p \rightarrow q$ (D) $p \leftrightarrow q$

13 Tabular form of $\{x \mid x \in N \wedge x+4=0\}$ is

(A) { } ● (B) {0} (C) {-4} (D) {0,4}

14 A square matrix A is symmetric if A^t =

(A) A^t (B) $-A^t$ (C) A ● (D) - A

15 If order of matrix A is 2 x 5 and order of B is 5 x 7 , then order of AB is ----------

(A) 5 x 2 (B) 7 x 5 (C) 7 x 2 (D) 2 x 7 ●

16 α , β are roots of $x^2+2x+1=0$, then $\alpha^2+\beta^2$ = ----------

(A) 8 (B) 4 (C) -2 (D) 2 ●

17 If ω is cube root of unity, then $(1+\omega+\omega^2)^2$ = ----------

(A) ω (B) ω^2 (C) 0 ● (D) 1

18 $\frac{2}{x^2-1} = \frac{1}{x-1} + \frac{B}{x+1}$, then value of B is

(A) 1 (B) -1 ● (C) 2 (D) -2

19 Sum the series $1+\frac{9}{10}+\frac{81}{100}+$ ----------

(A) 10 ● (B) 9 (C) 9/10 (D) $\frac{10}{9}$

20 5th term of sequence whose general term is $a_n = n + (-1)^n$ is

(A) 4 ● (B) -4 (C) 5 (D) -5

11th CLASS – 1st Annual 2024

MATHEMATICS		TIME: 2 HRS 30 MINUTES
GROUP : FIRST	SUBJECTIVE PART	MARKS: 80

SECTION–I

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Simplify $(7, 9) + (3, -5)$
ii	Find the multiplicative inverse of $(-4, 7)$
iii	$\forall z \in C$, prove that $z.\bar{z} = \lvert z \rvert^2$
iv	Simplify i^{-10}
v	Write the power set of $\{9, 11\}$
vi	Construct the truth table for $(p \wedge \sim p) \rightarrow q$
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 square matrices of the same order, then explain why in general $(A+B)^2 \neq A^2 + 2AB + B^2$
ix	Without expansion show that $\begin{vmatrix} 6 & 7 & 8 \\ 3 & 4 & 5 \\ 2 & 3 & 4 \end{vmatrix} = 0$
x	Solve the equation $x^2 - 2x - 899 = 0$ by completing the square
xi	Evaluate $\omega^{28} + \omega^{29} + 1$
xii	Find the condition that one root of equation $x^2 + px + q = 0$ is double the other.

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Define an identity
ii	Change $\frac{6x^3+5x^2-7}{2x^2-x-1}$ in to proper fraction
iii	Find the next two terms 1 , 3 , 7 , 15 , 31 , ---------
iv	If $a_{n-3} = 2n-5$, find the nth term of the sequence
v	Show that the reciprocals of the terms of the geometric sequence a_1 , a_1r^2, a_1r^4, ---------- form another geometric sequence
vi	Find A.M between $x - 3$ and $x+5$
vii	Find the value of n when ${}^nP_4 : {}^{n-1}P_3 = 9 : 1$
viii	Find the value of n when ${}^nC_{10} = \frac{12 \times 11}{2!}$
ix	Determine the probability of getting 2 heads and 2 tails when a coin is tossed four times
x	Prove $1 + 4 + 7 + \text{--------} + (3n - 2) = \frac{n(3n-1)}{2}$
xi	Calculate by means of Binomial theorem $(0.97)^3$
xii	Expand $(8 - 5x)^{-2/3}$ up to four terms.

(P.T.O)

QUESTION NO. 4 Write short answers any Nine (9) of the following **18**

i	If $\tan\theta = \frac{8}{15}$ and terminal arm of the angle is in the III quadrant, find the value of $\sin\theta$ and $\cos\theta$
ii	Prove that $\sec^2\theta - \operatorname{cosec}^2\theta = \tan^2\theta - \cot^2\theta$
iii	If α, β, γ are angles of a triangle ABC, Prove that $\tan(\alpha+\beta) + \tan\gamma = 0$
iv	Find value of $\sec 75^\circ$, without using tables
v	Prove that $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$
vi	Write the domain and range of $y = \tan x$
vii	Find the period of $\operatorname{cosec} 10x$
viii	Draw the graph of $y = \sin\frac{x}{2}$ for $0 \le x \le 2\pi$
ix	Find the smallest angle of the triangle ABC, when $a = 37.34$, $b = 3.24$, $c = 35.06$
x	Find area of triangle ABC, if $a = 18$, $b = 24$, $c = 30$
xi	Prove that $r\, r_1\, r_2\, r_3 = \Delta^2$
xii	Without using calculator, show that $2\cos^{-1}\frac{4}{5} = \sin^{-1}\frac{24}{25}$
xiii	Find the solution of equation $\operatorname{cosec}\theta = 2$ which lies in $[0, 2\pi]$

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	For what values of m, will the roots of the equation $x^2 - 2(1+3m)x + 7(3+2m) = 0$ be equal
(B)	Solve the system linear equations by Cramer's Rule $2x_1 - x_2 + x_3 = 8$, $x_1 + 2x_2 + 2x_3 = 6$, $x_1 - 2x_2 - x_3 = 1$
Q.6- (A)	Resolve into partial fractions $\frac{1}{(1-ax)(1-bx)(1-cx)}$
(B)	If $y = \frac{2}{3}x + \frac{4}{9}x^2 + \frac{8}{27}x^3 + \text{----------}$ and if $0 < x < \frac{3}{x}$, then show that $x = \frac{3y}{2(1+y)}$
Q.7-(A)	Prove that ${}^{n-1}C_r + {}^{n-1}C_{r-1} = {}^{n}C_r$
(B)	If x is so small that its square and higher powers can be neglected, show that $\frac{1-x}{\sqrt{1+x}} \approx 1 - \frac{3}{2}x$
Q.8-(A)	Show that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$
(B)	By using $\Delta = \frac{1}{2}bc\sin\alpha$ drive the Hero's formula
Q.9-(A)	If $\cot\theta = \frac{5}{2}$ and the terminal arm of the angle is in the I quad, find the value of $\frac{3\sin\theta + 4\cos\theta}{\cos\theta - \sin\theta}$
(B)	Prove that $2\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} = \frac{\pi}{4}$

MATHEMATICS	PAPER CODE – 6196	TIME : 30 MINUTES
GROUP : SECOND	11th CLASS – 1st Annual 2024	MARKS : 20
	OBJECTIVE	

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 circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero marks in that question.

QUESTION NO. 1

1 If polynomial $x^2 - 2x + 2$ is divided by $x - 1$, then remainder is
(A) -1 (B) 1 ● (C) 0 (D) 2

2 Partial fraction of $\frac{x}{(x-1)(x+2)} = \frac{1}{3(x-1)} + \frac{B}{x+2}$, then value of B is
(A) -3/2 (B) 3/2 (C) 2/3 ● (D) -2/3

3 Sum of n-arithmatic means between a and b is
(A) $\frac{a+b}{2}$ (B) n(a+b) (C) (a+b) (D) $n\left(\frac{a+b}{2}\right)$ ●

4 Next term of sequence 7 , 9 , 12 , ... Is
(A) 14 (B) 15 (C) 16 ● (D) 18

5 Number of necklaces can be made from 6 beads
(A) 720 (B) 120 (C) 90 (D) 60 ●

6 Middle term in expansion of $(3 + x)^4$ is
(A) $81x^2$ (B) $54x^2$ ● (C) $26x^2$ (D) $108x^2$

7 One degree is equal to ..... radian
(A) $\frac{180}{\pi}$ (B) $\frac{\pi}{180}$ ● (C) $\frac{\pi}{90}$ (D) π

8 cot (90 - α) = ...
(A) $\tan\alpha$ ● (B) $-\tan\alpha$ (C) $\cot\alpha$ (D) $-\cot\alpha$

9 Period of sin x/3 is
(A) 2π (B) $2\pi/3$ (C) 6π ● (D) 3π

10 cos $\alpha/2$ = ...
(A) $\frac{s(s-a)}{bc}$ (B) $\frac{s(s-b)}{ac}$ (C) $\sqrt{\frac{s(s-a)}{bc}}$ ● (D) $\sqrt{\frac{s(s-b)}{ac}}$

11 sec $(\cos^{-1}\frac{1}{2})$ = ----------
(A) 1/2 (B) 2 ● (C) $\pi/3$ (D) $\pi/6$

12 If cos x = $-\sqrt{3}/2$, then value of x is
(A) $\frac{5\pi}{6}$ (B) $\frac{\pi}{6}$ ● (C) $\frac{\pi}{3}$ (D) $-\pi/3$

13 $a < b \Rightarrow -a > -b$, $a, b \in R$ property used is
(A) Transitive (B) Additive (C) Multiplicative ● (D) Trichotomy

14 If $Z = 1 - i$, then $|Z|$ = ...
(A) 2 (B) -2 (C) $\sqrt{-2}$ (D) $\sqrt{2}$ ●

15 A and B are disjoint sets then
(A) $A \cap B = \emptyset$ ● (B) $A \cup B = \emptyset$ (C) $A - B = \emptyset$ (D) $B - A = \emptyset$

16 Tabular form of $\{x \mid x \in E \wedge 2 < x \leq 4\}$
(A) {2 , 3 , 4} (B) {2 , 4} (C) {4} ● (D) { $\emptyset$ }

17 The set A has m elements , Number of elements in power set of A
(A) 2^{m-1} (B) 2^m ● (C) 2^{m+1} (D) $2^{m/2}$

18 Rank of $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ is
(A) Zero (B) 1 ● (C) - 1 (D) 2

19 Determinant of [-5] is
(A) Zero (B) Not possible (C) - 5 ● (D) 5

20 α , β are roots of $ax^2 - bx + c = 0$, then $\alpha + \beta$ = ----------
(A) $\frac{b}{a}$ ● (B) $-\frac{b}{a}$ (C) $\frac{c}{a}$ (D) $-\frac{c}{a}$

11th CLASS – 1st Annual 2024

MATHEMATICS	SUBJECTIVE PART	TIME: 2 HRS 30 MINUTES
GROUP : SECOND		MARKS: 80

SECTION–I

QUESTION NO. 2 Write short answers any Eight (8) of the following 16

i	Simplify $(5, -4)(-3, -2)$
ii	Separate into real and imaginary parts $\frac{2-7i}{4+5i}$
iii	Prove that $\bar{Z} = Z$ if Z is real
iv	Simplify $(a+bi)^2$
v	Write two proper subsets of $\{a, b, c\}$
vi	Show that $(p \wedge q) \rightarrow p$ is a tautology
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	Find the matrix X if $\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix} X = \begin{bmatrix} 2 & 1 \\ 5 & 10 \end{bmatrix}$
ix	If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$, then find A_{12} and A_{32}
x	Evaluate $\omega^{28} + \omega^{29} + 1$
xi	Use remainder theorem to find the remainder when $x^2 + 3x + 7$ is divided by $x + 1$
xii	Discuss the nature of the roots of equation $2x^2 - 5x + 1 = 0$

QUESTION NO. 3 Write short answers any Eight (8) of the following 16

i	Define partial fraction resolution
ii	Suppose $\frac{7x+25}{(x+3)(x+4)} = \frac{A}{x+3} + \frac{B}{x+4}$ Find the values of A and B
iii	Write the first four terms of the following sequence, if $a_n = (-1)^n n^2$
iv	Which term of the A.P $5, 2, -1, \ldots\ldots$ is -85 ?
v	If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in G.P. Show that the common ratio is $\pm\sqrt{\frac{a}{c}}$
vi	Show that $G^2 = AH$ if $a = 2i$, $b = 4i$
vii	Find the value of n if ${}^nP_2 = 30$
viii	Find the number of the diagonals of a 6-sided figure
ix	A die is rolled. What is the probability that the dots on the top are greater than 4 ?
x	Prove that $4^k > 3^k + 4$ is true for $k = 2, 3$
xi	Calculate $(0.97)^3$ by means of binomial theorem
xii	Expand up to 4 terms $(1-x)^{1/2}$, taking the values of x such that the expansion is valid

(P.T.O)

QUESTION NO. 4 Write short answers any Nine (9) of the following **18**

i	Find ℓ , when $\theta = 65^\circ 20'$, $r = 18$ mm
ii	Verify that $2 \sin 45^\circ + \frac{1}{2} \operatorname{cosec} 45^\circ = \frac{3}{\sqrt{2}}$
iii	Without using the tables , find the value of sec (- 300)
iv	Prove that $\frac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \tan 37^\circ$
v	Prove that $1 + \tan \alpha \tan 2\alpha = \sec 2\alpha$
vi	Write down the domain and range of $\sin x$
vii	Find the period of $\cot \frac{x}{2}$
viii	Draw the graph of $y = \cos x$ for $0 \leq x \leq 360^\circ$
ix	What is difference between right angle triangle and oblique triangle
x	Find the area of the triangle ABC , if $a = 200$, $b = 120$, $\gamma = 150^\circ$
xi	Find the radius of in-circle if $a = 13$, $b = 14$, $c = 15$
xii	Without using calculator , show that $\tan^{-1} \frac{5}{12} = \sin^{-1} \frac{5}{13}$
xiii	Solve the equation $\sin x + \cos x = 0$

SECTION-II

Note: Attempt any Three questions from this section **10 x 3 = 30**

Q.5- (A)	Solve the equation $\sqrt{5x^2 + 7x + 2} - \sqrt{4x^2 + 7x + 18} = x - 4$
(B)	Use matrices to solve the following system of equation $2x_1 + x_2 + 3x_3 = 3$ $x_1 + x_2 - 2x_3 = 0$ $-3x_1 - x_2 + x_3 = -4$
Q.6- (A)	Resolve the following into partial fractions $\frac{x^2}{(x-2)(x-1)^2}$
(B)	Find n so that $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ may be the A.M. between a and b
Q.7-(A)	A natural number is chosen out of the first fifty natural numbers. What is the probability that the chosen number is multiple of 3 or 5 ?
(B)	Expand $\left(\frac{x}{2} - \frac{2}{x^2}\right)^6$ by using binomial theorem
Q.8-(A)	Show that $\cos 20^\circ \cos 40^\circ \cos 80^\circ = \frac{1}{8}$
(B)	The sides of triangle are $x^2 + x + 1$, $2x + 1$ and $x^2 - 1$ Prove that the greatest angle of the triangle is 120°
Q.9-(A)	Prove that : $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$ Where θ is not an odd multiple of $\frac{\pi}{2}$
(B)	Prove that : $\cos^{-1} A + \cos^{-1} B = \cos^{-1} [AB - \sqrt{1 - A^2}\sqrt{1 - B^2}]$

MATHEMATICS HSSC (11th) 1st Annual 2024 Roll No _____ (To be filled in by the candidate)

Paper: I Objective - (iii) Paper Code | 6 | 1 | 9 | 5 | Marks: 20 Time: 30 Minutes

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 circle in front of that question number in you answer book. Use marker or pen to fill the circles. Cutting or filling up two or more circles will result no mark.

SECTION – A

Q.1	Questions	A	B	C	D
1.	$2\sin 45° + \frac{1}{2}\operatorname{cosec} 45° =$ _____	1	-1	$\frac{3}{\sqrt{2}}$ ●	$\sqrt{\frac{2}{3}}$
2.	The value of $\sec\left(\sin^{-1}\frac{\sqrt{3}}{2}\right) =$ _____	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	2 ●	$\frac{1}{2}$
3.	In any triangle ABC, $\frac{c^2+a^2-b^2}{2ac} =$ ___	$\cos\alpha$	$\cos\beta$ ●	$\cos\gamma$	$\cos(\beta+\alpha)$
4.	If a = 1, b = 5 then A × H = _____	$\frac{2}{5}$	$\frac{5}{2}$	5 ●	-5
5.	$\sin(-300°) =$ _____	$-\frac{\sqrt{3}}{2}$	$\frac{\sqrt{3}}{2}$ ●	$\frac{2}{\sqrt{3}}$	0
6.	If $\cos x = \frac{1}{\sqrt{2}}$, then reference angle is:	$\frac{\pi}{6}$	$\frac{\pi}{4}$ ●	$\frac{\pi}{3}$	$\frac{\pi}{2}$
7.	Every non-recurring, non-terminating decimal represents _____ number.	rational	irrational ●	whole	natural
8.	${}^6P_3 =$ _____	6	18	36	120 ●
9.	Range of $\sin\left(\frac{x}{2}\right)$ is:	$[\frac{1}{2}, -\frac{1}{2}]$	$[-2, 2]$	$[2, -2]$	$[-1, 1]$ ●
10.	If $a_{n-2} = 3n - 11$, then nth term is:	$3n + 2$	$3n - 5$ ●	$3n + 5$	$3n - 3$
11.	$(A \cup B)^c =$ _____	$A \cup B$	$A \cap B$	$A^c \cup B^c$	$A^c \cap B^c$ ●
12.	The product of the roos of equation $x^2 + 2x + 1 = 0$, is _____	2	3	1 ●	-1
13.	If $4^x = \frac{1}{2}$ then x = _____	$\frac{1}{4}$	$\frac{1}{2}$	$-\frac{1}{2}$ ●	2
14.	Rank of the matrix $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ is _____	2 ●	-1	0	$\sqrt{-1}$
15.	If $\begin{vmatrix}k & 4\\ 4 & k\end{vmatrix} = 20$ then k = _____	± 36	± 24	± 16	± 6 ●
16.	$A \subseteq B$ then complement of A in B (B-Universal):	$A - B$	$B - A$ ●	$A \cap B$	$A \cup B$
17.	$\frac{A}{x-1} + \frac{B}{x+1}$ is a partial fraction of:	$\frac{1}{x^3-1}$	$\frac{1}{x^2-1}$ ●	$\frac{1}{1-x^2}$	$\frac{1}{x^2+1}$
18.	(Z, +) has identity element:	0 ●	i	1	-1
19.	Multiplicative inverse of $(0, -1) \in C$, is:	(0,1) ●	(1,0)	(−1,0)	(1,1)
20.	$(r + 1)^{th}$ term in the expansion of $(a+b)^n$ is:	$\binom{n}{r}a^{n-r}b^r$ ●	$\binom{n}{r}a^{n-r}b^{r-1}$	$\binom{n}{r}a^{n+r}b^r$	$\binom{n}{r}a^{n+1}b^{r+1}$

MATHEMATICS HSSC (11th) 1st Annual 2024 Roll No _____ (To be filled in by the candidate)

Paper: I **Subjective** **Marks: 80** **Time: 2:30 Hours**

Note: Section B is compulsory. Attempt any THREE questions from Section C.

SECTION - B

Q2. Write short answers to any Eight parts. (8×2 = 16)

(i) Factorize $9a^2 + 16b^2$.

(ii) Define modulus of a complex number.

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

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

(v) Write the set $\{x \mid x \in Q \wedge x^2 = 2\}$.

(vi) Convert $(A \cap B)' = A' \cup B'$ into logical form.

(vii) Define diagonal matrix and give an example.

(viii) Show that for a non-singular matrix A, $(A^{-1})^{-1} = A$.

(ix) Define co-factor of an element.

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

(xi) Reduce $x^{-2} - 10 = 3x^{-1}$ to quadratic form.

(xii) Show that $x^3 - y^3 = (x - y)(x - \omega y)(x - \omega^2 y)$.

Q3. Write short answers to any Eight parts. (8×2 = 16)

(i) Define improper fraction.

(ii) Change $\frac{x^2 + 1}{x^2 - 1}$ into proper fraction.

(iii) Find 9th term of the sequence $-\frac{1}{5}, -\frac{1}{3}, -1, \ldots$

(iv) For $a = 2i$, $b = 4i$, show that $G^2 = A \times H$.

(v) Find the first term of the geometric series if $a_n = (-3)\left(\frac{2}{5}\right)^n$

(vi) If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P, show that the common ratio is $\pm\sqrt{\frac{a}{c}}$.

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

(viii) How many triangles and diagonals can be formed by joining the vetices of 8-sided polygon?

(ix) Define cicular permutation.

(x) From the expansion of $\left(\frac{3x}{2} - \frac{1}{3x}\right)^{11}$, find the sixth term from the end.

(xi) Expand $(8 - 5x)^{-\frac{2}{3}}$ up to four terms.

(xii) Evaluate $\sqrt[5]{31}$ correct to three decimal places.

Q4. Write short answers to any Nine parts. (9×2 = 18)

(i) Express $\theta = 120°40''$ in radians.

(ii) If $\sin\theta = \frac{12}{13}$ and terminal arm of angle is in quadrant I, find $\tan\theta$ and $\cos\theta$.

(iii) Find the value of $\sin(-300°)$.

(iv) Prove that $\sin\left(\theta + \frac{\pi}{6}\right) + \cos\left(\theta + \frac{\pi}{3}\right) = \cos$

(v) Write down the half angle identity for $\tan\left(\frac{\alpha}{2}\right)$.

(vi) Define period of a trigonometric function.

(vii) Prove that period of sin function is 2π.

(viii) Write down the domain and range for $y = \tan$

(ix) Solve the right triangle ABC in which $\gamma = 90°$, $a = 3.28$, $b = 5.74$.

(x) Write half angle formulas $\sin\left(\frac{\gamma}{2}\right)$ and $\cos\left(\frac{\gamma}{2}\right)$.

(xi) Define and draw an oblique triangle.

(xii) Find the value of $\sin\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)$.

(xiii) Find the solution $x \in [0, 2\pi]$, $\sin x = -\frac{\sqrt{}}{2}$

SECTION - C

Note: Attempt any THREE questions. Each question carries (5+5=10) marks.

Q5. (a) **Solve the system of linear equations by Cramer's Rule.**

$2x_1 - x_2 + x_3 = 8$; $x_1 + 2x_2 + x_3 = 6$; $x_1 - 2x_2 - x_3 = 1$

(b) **Solve systems of equations.** $x + y = 5$, $x^2 + 2y^2 = 17$

Q6. (a) **Resolve** $\frac{x^2 - 10x + 13}{(x - 1)(x^2 - 5x + 6)}$ **into partial fraction.**

(b) **Show that the sum of 'n' A.Ms between a and b is equal to n times their A.M.**

Q7. (a) **Prove that** ${}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$.

(b) **If x is nearly equal to 1 then prove that** $px^p - qx^q = (p - q)x^{p+q}$.

Q8. (a) **Prove that** $\frac{\tan\theta + \sec\theta - 1}{\tan\theta - \sec\theta + 1} = \tan\theta + \sec\theta$

(b) **Prove that** $\tan^{-1}\frac{120}{119} = 2\cos^{-1}\frac{12}{13}$

Q9. (a) **If** $\alpha + \beta + \gamma = 180°$, **show that** $\cot\alpha\cot\beta + \cot\beta\cot\gamma + \cot\gamma\cot\alpha = 1$.

(b) **Prove that** $r_1 + r_2 + r_3 - r = 4R$