☆☆☆☆ Roll No _____

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

Paper Code	6	1	9	7

Mathematics (Objective)

Group-I RWP-1-24 **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 Four 4th 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)

Marks .

Time: 2:30 hours

Mathematics (Subjective)

(GROUP-I)

RWP-1-24

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 $\sim(p \rightarrow q) \rightarrow p$

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 $x^3 - 2x^2 + 3x + 3$ is divided 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 $t^2\theta - cos^2\theta = cot^2\theta\, cos^2\theta$.

RWP-1-24

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 755876

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

Paper Code	6	1	9	2

Mathematics (Objective)

Group-II RWP-2-24 **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. $\frac{{}^{n}Pr}{r!}$ *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) $\frac{\pi}{6}$

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Roll No _____ to be filled in by the candidate

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

Marks : 80

Time: 2:30 hours

Mathematics (Subjective)

SECTION-I RWP-2-24

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 $p \to (q \to p)$ 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 $1, \frac{1}{3}, \frac{1}{9}, \ldots$

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.

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iv. Show that $cos(\propto +\beta)\cos(\propto -\beta) = cos^2 \propto -sin^2\beta$. RWP-2-24

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 $cos^{-1}\frac{63}{65} + 2tan^{-1}\frac{1}{5} = sin^{-1}\frac{3}{5}$