☆☆☆☆ 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
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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 $\sim(p \to q) \to p$

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

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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: $tan^{-1}\frac{1}{4} + tan^{-1}\frac{1}{5} = tan^{-1}\frac{9}{19}$