☆☆ Roll No _____ to be filled in by the candidate | HSSC-(P-I)-A/2023 | Paper Code | 6 | 1 | 9 | 3 |

Mathematics(Objective) (For All Sessions) Group-I Time: 30 Minutes Marks : 20

Rwp-11-1-23

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

(A) r_1 (B) r (C) R (D) Δ

2. In any ΔABC $\sqrt{\frac{S(S-c)}{ab}}$ is:

(A) $Cos\,\alpha/2$ (B) $Cos\,\beta/2$ (C) $Cos\,\gamma/2$ (D) $Cos\,\alpha$

3. $Cos\,(Tan^{-1}0) =$ ____

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

4. Solution of $1 + Cosx = 0$ in $[0\ 2\pi]$ is:

(A) π (B) $\frac{\pi}{2}$ (C) $\frac{3\pi}{2}$ (D) $\frac{5\pi}{2}$

5. The set$\{1\}$ possess closure property under:

(A) Addition (B) Multiplication (C) Subtraction (D) Both A & B

6. A function $f: A \to B$ is called an nto function if:

(A) Range of $f = A$ (B) Range of $f \neq A$ (C) Range of $f = B$ (D) Range of $f \neq B$

7. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & -2 & 0 \\ -2 & -2 & 1 \end{bmatrix}$ then $|A| =$ _____.

(A) 4 (B) 7 (C) 10 (D) 13

8. If order of a matrix "A" is $m \times n$ and order of matrix "B" is $n \times p$ then order of product of matrices AB is:

(A) $m \times p$ (B) $n \times p$ (C) $m \times n$ (D) $p \times n$

9. The roots of $x^2 - 7x + 10 = 0$ are:

(A) $-2, -5$ (B) $2, 5$ (C) $-2, 8$ (D) $2, -5$

10. If α, β are the roots of $3x^2 - 2x + 4 = 0$, then sum of roots is:

(A) $\frac{2}{3}$ (B) $-\frac{2}{3}$ (C) $\frac{4}{3}$ (D) $-\frac{4}{3}$

11. Partial fractions of $\frac{1}{(x-1)(x+1)}$ are:

(A) $\frac{A}{x-1} + \frac{B}{x+1}$ (B) $\frac{Ax+B}{x-1} + \frac{C}{x+1}$ (C) $\frac{A}{x-1} + \frac{Bx+c}{x+1}$ (D) $\frac{Ax+B}{x^2-1}$

12. Next two terms of sequence 7, 9, 12, 16, ... are:

(A) 18, 20 (B) 19, 21 (C) 20, 22 (D) 21, 27

13. If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in G.P then common ratio is:

(A) $\pm\sqrt{\frac{c}{a}}$ (B) $\pm\sqrt{\frac{a}{c}}$ (C) $\pm\sqrt{\frac{b}{c}}$ (D) $\pm\sqrt{\frac{c}{b}}$

14. $n_{P_2} = 30$, then n is:

(A) 6 (B) 5 (C) 4 (D) 3

15. In how many ways can 4-keys be arranged on a circular key ring:

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

16. $n! > n^2$ is true for $n =$:

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

17. The formula for $(r+1)th$ term of binomial expansion of $(a+x)^n$ is:

(A) $\binom{n}{r} a^{n-r} x^r$ (B) $\binom{n}{r} a^{n+r} x^r$ (C) $\binom{n}{r} a^n x^{n-r}$ (D) $\binom{n}{r} a^n x^{n+r}$

18. Which one is the quadrantal angle:

(A) 30^0 (B) 45^0 (C) 60^0 (D) 90^0

19. $Cos\,2\alpha =$ _____.

(A) $1 - 2\,Cos^2\alpha$ (B) $2\,Cos^2\alpha - 1$ (C) $Sin\,\alpha\,Cos\,\alpha$ (D) $2Sin\,\alpha\,Cos\,\alpha$

20. Period of Cosec $\frac{x}{4}$ is:

(A) 2π (B) 4π (C) 6π (D) 8π

Roll No _____ to be filled in by the candidate | HSSC-(P-I)-A/2023 | Marks : 80

Mathematics (Subjective) (For All Sessions) (GROUP-I) Time: 2:30 hours

Rwp-11-1-23

SECTION-I

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

i. Name the properties used in equations: (a): $100 + 0 = 100$ (b): $1000 \times 1 = 1000$

ii. Separate into real and imaginary parts, if $Z = \frac{i}{1+i}$

iii. Differentiate between Equal and Equivalent sets, with example.

iv. Write the set: $\{x | x \in N \wedge 4 < x < 12\}$, in descriptive and tabular forms:

v. Define semi-group.

vi. Find values of x if $\begin{vmatrix} 3 & 1 & x \\ -1 & 3 & 4 \\ x & 1 & 0 \end{vmatrix} = -30$

vii. If the matrices A and B are symmetric and $AB = BA$, show that AB is symmetric.

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

ix. Solve: $x(x+7)=(2x-1)(x+4)$ by factorization.

x. If ω is a cube root of unity, form an equation whose roots are $Z\omega$ and $Z\omega^2$

xi. Find two consecutive numbers, whose product is 132.

xii. Find the three cube roots of -8

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

i. Without finding constants write $\frac{x^2-10+13}{(x-1)(x^2-5x+6)}$ into partial fractions.

ii. Find vulgar fraction equivalent to recurring decimal 0.7

iii. Find the nth term of sequence $\left(\frac{4}{3}\right)^2, \left(\frac{7}{3}\right)^2, \left(\frac{10}{3}\right)^2, \ldots$

iv. Calculate geometric means between 4 and 16.

v. If $y = \frac{2x}{3} + \frac{4x^2}{9} + \frac{8x^3}{27} + \cdots$ and if $0 < x < 3/4$, then show that $x = \frac{3y}{2(1+y)}$

vi. Find 12th term of H.P: $1/3, 2/9, 1/6, \ldots$

vii. Find the term involving x^{-2} in the expansion of $\left(x - \frac{2}{x^2}\right)^{13}$

viii. How many words can be formed from PLANE using all letters when no letter is to be repeated.

ix. Write formula for ${}^nP_r$ and ${}^nC_r$

x. A die is thrown. Find the probability that dots on top are prime numbers.

xi. Expand $(1-x)^{1/2}$ up to 4 terms by binomial theorem.

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

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

i. Define the word "Trigonometry"

ii. Find $tan\theta$ and $cot\theta$ for $\theta = \frac{19\pi}{3}$

iii. Show that $sin^2\left(\frac{\pi}{6}\right) + sin^2\left(\frac{\pi}{3}\right) + tan^2\left(\frac{\pi}{4}\right) = 2$

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

v. Prove that $Sin(180^0+\propto)\, Sin(90^0-\propto) = -Sin \propto Cos \propto$.

vi. Define the principal tangent function.

vii. Prove that $Sin(\propto+\beta)Sin(\propto-\beta) = cos^2\beta - cos^2 \propto$.

viii. Define the period of a Trigonometry function

ix. Solve the right triangle ABC in which: $r = 90^0$, $b = 68.4$, $c = 96.2$

x. Solve the triangle ABC if $\beta = 60^0$, $r = 15^0$, $b = \sqrt{6}$

xi. Find the area of triangle ABC for $b = 21.6$, $c = 30.2$, $\propto = 52^0 40'$

xii. Define the trigonometric equation.

xiii. Find the solution of Cosec $\theta = 2$ which lie in the interval $[0, 2\pi]$

SECTION-II

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

5. (a) Find the matrix A if: $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} A = \begin{bmatrix} 0 & -3 & 8 \\ 3 & 3 & -7 \end{bmatrix}$

(b) For what values of "m" the roots of the equation $x^2 - 2(1+3m)x + 7(3+2m) = 0$ be equal?

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

(b) Find the values of n and r when ${}^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3 : 6 : 11$

7. (a) Sum the series up to n terms $2 + (2+5) + (2+5+8) + \cdots$

(b) Use binomial theorem to show that: $1 + \frac{1}{4} + \frac{1.3}{4.8} + \frac{1.3.5}{4.8.12} + \cdots = \sqrt{2}$

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

(b) Prove that $cos20^0 + cos100^0 + cos140^0 = 0$

9. (a) The measures of sides of a triangular plot are 413,214 and 375 meters. Find the measure of corner angles of the plot.

(b) $\frac{1}{3}$, $\frac{8}{}$, $\frac{77}{}$

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HSSC-(P-I)-A/2023 (For All Sessions)

Paper Code | 6 | 1 | 9 | 8

(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.

RWP-11-2-23

1.1 The sum of infinite geometric series with common ratio $|r| < 1$ is:

(A) $\frac{a}{1-r}$ (B) $\frac{a}{1+r}$ (C) $\frac{a}{1-r^2}$ (D) $\frac{a}{1+r^2}$

2. A die is rolled. The probability that the dot on the top is greater than 4 is:

(A) $\frac{1}{6}$ (B) $\frac{1}{3}$ (C) $\frac{1}{2}$ (D) $\frac{2}{3}$

3. The value of ${}^{12}C_{10} =$

(A) 11 (B) 66 (C) 22 (D) 2

4. The sum of exponents of a and b in every term in the expansion of $(a+b)^n$ is:

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

5. The inequality $n! > 2^n - 1$ is valid if n is:

(A) $n = 3$ (B) $n \leq 3$ (C) $n > 3$ (D) $n \geq 3$

6. $\frac{2\pi}{3}$ radians $=$

(A) 120^0 (B) 60^0 (C) 90^0 (D) 30^0

7. $Sin(2\pi - \theta) =$

(A) $Sin\theta$ (B) $-Sin\theta$ (C) $Cos\theta$ (D) $-Cos\theta$

8. The period of $Sin\, 2x =$

(A) 2π (B) -2π (C) π (D) $-\pi$

9. $\sqrt{\frac{s(s-a)}{bc}} =$

(A) $\sin\frac{\alpha}{2}$ (B) $\sin\frac{\beta}{2}$ (C) $\cos\frac{\alpha}{2}$ (D) $\cos\frac{\beta}{2}$

10. Hero's formula for area of triangle is:

(A) $\sqrt{s(s-a)(s-b)(s-c)}$ (B) $\frac{1}{2}bc\sin\alpha$ (C) $\frac{c^2\sin\alpha\sin\beta}{2\sin r}$ (D) $\frac{1}{2}ab\sin r$

11. $Sin^{-1}\left(-\frac{1}{2}\right) =$

(A) $\frac{\pi}{3}$ (B) $-\frac{\pi}{3}$ (C) $\frac{\pi}{6}$ (D) $-\frac{\pi}{6}$

12. If $\sin x = \cos x$ then $x =$

(A) 0^0 (B) 30^0 (C) 45^0 (D) 60^0

13. The equation $x^2 + 1 = 0$ has solution in:

(A) $\mathbb{R}$ (B) $\mathbb{C}$ (C) $\mathbb{Q}$ (D) $\mathbb{Q}$

14. Let $p \rightarrow q$ be a given conditional then $\sim q \rightarrow \sim p$ is:

(A) Converse (B) Inverse (C) Contra positive (D) Positive

15. If A and B are non singular matrices, then $(AB)^{-1}$ is equal to:

(A) $\frac{1}{AB}$ (B) $A^{-1}B^{-1}$ (C) BA (D) $B^{-1}A^{-1}$

16. $AX = 0$ is homogeneous system with $|A| \neq 0$ then system has:

(A) No solution (B) Trivial solution (C) Non-trivial solution (D) Infinite solution

17. If $4^{-x} = \frac{1}{2}$ then $x =$:

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

18. An equation which remains unchanged when x is replaced by $\frac{1}{x}$ is:

(A) Exponential (B) Reciprocal (C) Radical (D) Reducible

19. Partial fractions of $\frac{1}{x^2-1}$ will be of the form:

(A) $\frac{A}{x+1} + \frac{B}{x-1}$ (B) $\frac{Ax+B}{x^2-1}$ (C) $\frac{Ax}{x+1} + \frac{B}{x-1}$ (D) $\frac{A+Bx}{x^2-1}$

20. General term of the sequence 1,3,5 ... is:

(A) $2n+2$ (B) $2n$ (C) $2n-1$ (D) $3n$

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HSSC-(P-I)-A/2023

(For All Sessions)

Marks : 80

Mathematics (Subjective)

GROUP-II

Time: 2:30 hours

SECTION-I

Rwp-11-2-23

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

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

ii. Prove that $\bar{\bar{z}} = z$ if z is a real number.

iii. Write down the power set of $\{9, 11\}$.

iv. Construct the truth table for $(P \wedge \sim P) \rightarrow q$

v. Define a group.

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

vii. Find x if $\begin{vmatrix} 1 & x-1 & 3 \\ -1 & x+1 & 2 \\ 2 & -2 & x \end{vmatrix} = 0$

viii. Show that AA^t is symmetric for any matrix of order $3x3$.

ix. Solve the equation: $(a+b)x^2 + (a+2b+c)x + b + c = 0$

x. Find the condition that one root of $x^2 + px + q = 0$ is double the other.

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

xii. Solve the equations simultaneously: $x + y = 5;\ x^2 + 2y^2 = 17$

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

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

ii. Write the first three terms of $\{a_n\} = \left\{\frac{1}{2^n}\right\}$

iii. If nth term of the $A.P.$ is $3n - 1$, find the $A.P.$

iv. Evaluate: $4!.0!.1!$

v. Which term of the sequence: $x^2 - y^2, (x+y), \frac{(x+y)}{(x-y)}, \ldots$ is $\frac{x+y}{(x-y)^9}$?

vi. Define Harmonic Mean. Also derive formula.

vii. How many numbers greater than 1000,000 can be formed from the digits 0,2,2,2,3,4,4?

viii. Find the value of n when ${}^nC_{10} = \frac{12 \times 11}{2!}$

ix. Prove that: $n! > n^2$ for $n = 4, 5$.

x. Expand $(1+x)^{-2}$ upto 3 terms.

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

xii. Using binomial theorems: $(1.03)^{1/3}$, calculate the value upto three decimal places.

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

i. Find θ when $l = 1.5\ cm$, $r = 2.5\ cm$

ii. Write domain and range of $\sin x$

iii. If $\tan\theta < 0$ and $\sin\theta > 0$ in which quadrant θ will lie.

iv. Prove than $\sin^2 \pi/6 + \sin^2 \pi/3 + \tan^2 \pi/4 = 2$

v. Prove that $R = \frac{abc}{4\Delta}$

vi. Find the distance between $A(3, 8)$ and $B(5, 6)$.

vii. State law of Sines.

viii. Prove that $\sin(45^0 + \alpha) = \frac{1}{\sqrt{2}}(\sin\alpha + \cos\alpha)$

ix. Find the value of $\sin 2\alpha$ when $\cos\alpha = \frac{3}{5}$ and $0 < \alpha < \pi/2$

x. For ΔABC if $\alpha = 35°17'$; $\beta = 45°13'$; $b = 421$ find a and r.

xi. Find the value of $\cos(\sin^{-1}\frac{1}{\sqrt{2}})$

xii. Solve $\cos x = \frac{\sqrt{3}}{2}$ where $x \in [0, 2\pi]$

xiii. Define trigonometric equation. Give one example.

SECTION-II

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

5. (a) Reduce the following matrix into echelon form: $\begin{bmatrix} 2 & 3 & -1 & 9 \\ 1 & -1 & 2 & -3 \\ 3 & 1 & 3 & 2 \end{bmatrix}$

(b) For what value of m will the roots of following equation be equal?
$(1+m)x^2 - 2(1+3m)x + (1+8m) = 0$

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

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

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

(b) If x is very near equal to 1. Then prove that $Px^p - qx^q \approx (p-q)x^{p+q}$

8. (a) A railway train is running on circular track of radius 500 meters at the rate of 30 km per hours. Through what angle it turn in 10 seconds.

(b) Show that $\cos 20° \cos 40° \cos 80° = \frac{1}{8}$

9.(a) Show that $r_1 = 4R \sin\frac{\alpha}{2} . \cos\frac{\beta}{2} . \cos\frac{\gamma}{2}$

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