☆☆ 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**

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-11-1-23

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 into 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) $-2, 5$ (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

SECTION-I

Rwp-11-1-23

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) $\cos^{-1}\frac{3}{5} - \cos^{-1}\frac{8}{17} = \sin^{-1}\frac{77}{85}$

☆☆☆☆ Roll No _____ to be filled in by the candidate

HSSC-(P-I)-A/2023

Paper Code | 6 | 1 | 9 | 8

(For All Sessions) (Group-II)

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

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

(A) $\sqrt{s(s-a)(s-b)(s-c)}$ (B) $\frac{1}{2}bc\sin\propto$ (C) $\frac{C^2 \sin\propto \sin\beta}{2\sin r}$ (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) $3n$

Roll No _____ to be filled in by the candidate

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 $\tan^{-1}\frac{120}{119} = 2\cos^{-1}\frac{12}{13}$

$2\theta =$

$Sin^2\theta$ (B) $2Cos^2\theta$ (C) $2Sin^2\theta/2$ (D) $2Cos^2\theta/2$

of Tangent function is $\mathbb{R}$ excluding. _____

(B) $2n\frac{\pi}{3}$ (C) $(2n+1)\pi$ (D) $(2n+1)\frac{\pi}{2}$

ual notation. 2S -b = _____

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

of c – circle is given by.

$\frac{\Delta}{-b}$ (B) $\frac{\Delta}{S+b}$ (C) $\frac{S-b}{\Delta}$ (D) $\frac{\Delta}{S+C}$

or $x \le -1$ is the domain of.

$n\,x$ (B) $Cos^{-1}\,x$ (C) $Sec^{-1}\,x$ (D) $Cot^{-1}\,x$

ation of $\sin x + Cos\,x = 0$ in $[0, 2\pi]$

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

nt (θ) of $(\sqrt{3}+i)$ is .

(B) $30°$ (C) $45°$ (D) $90°$

$\}$ is group under.

dition (B) Subtraction (C) Multiplication (D) Intersection

singular matrices A and B $XA = B^{-1} \Rightarrow X =$

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

of A is n x m and order of B is m x n then order of $(AB)^1$ is.

m (B) m x m (C) m x n (D) n x n

$\frac{1}{2}$ then $x =$

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

is a factor of $f(x)$, then for $f(x)=0$ $x = a$ is.

ot (B) Factor (C) Polynomial (D) Degree

raction of $\frac{1}{x^3+1}$ will be of the form.

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

tric series is convergent if.

< 1 (B) $|r| > 1$ (C) $|r| \le 1$ (D) $|r| \ge 1$

$\frac{-1)(n-2)}{3}$ (B) $\frac{n(n-1)(n-2)}{6}$ (C) $\frac{n(n+1)(2n+1)}{3}$ (D) $\frac{n(n+1)(2n+1)}{6}$

(B) ∞ (C) 3 (D) 6

d only if.

n (B) $r > n$ (C) $r \le n$ (D) $r \ge n$

exponents of a and b in the expansion of $(a + b)^n$ in each term is.

(B) 2n (C) n^2 (D) $n + 1$

Roll No._____ to be filled in by the Candidate

Inter . (Part-I)-A-2022

MATHEMATICS (Essay Type) **(For All Sessions)**

Time: 2:30 Hours **Marks: 80**

SECTION - I

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

i- Does the set {1, -1} possess closure property w.r.t addition and subtraction?

ii- Simplify $(-1)^{\frac{-21}{2}}$

iii- $\forall Z \in C$, show that $|-Z| = |Z|$

iv- From suitable properties of union and intersection deduce $A \cap (A \cup B) = A \cup (A \cap B)$

v- Construct the truth table of the statement $(P \wedge \sim P) \rightarrow q$.

vi- Give the table for addition of elements of the set of residue classes modulo 5.

vii- If $A = [a_{ij}]_{3\times 3}$ show that $(\lambda + \mu)A = \lambda A + \mu A$.

viii- If all the entries of a column of a square matrix A are zero, then show that $|A| = 0$.

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

x- Prove that product of all the three cube roots of unity is 1

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

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

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

i- Define proper rational fraction.

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

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

iv- Find the sum of 20 terms of the series whose r^{th} term is 3r + 1.

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

vii- If 5 is the harmonic mean between 2 and b, find b.

viii- Find the value of n when: $\overset{11}{P}_{n} = 11.10.9$

ix- How many diagonals can be formed by goining the vertices of the polygon having 8 sides?

x- Use mathematical induction to prove the formula for n = 1 and n = 2

$$1 + 4 + 7 + ... + (3n-2) = \frac{n(3n-1)}{2}$$

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

xii- Expand $(4-3x)^{1/2}$ up to 3 terms, taking the value of x such that the expansion is valid.

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

i- If $Cot\theta = \frac{15}{8}$ and terminal arm of angle is not in I quadrant find values of $\cos\theta$ and $\cos ec\theta$

ii- Find values of trigonometric functions of $\frac{-7\pi}{4}$

iii- Prove the identity $(\tan\theta + \cot\theta)^2 = Sec^2\theta\, Cosec^2\theta$

iv- Prove that $Cos306^\circ + Cos234^\circ + Cos162^\circ + Cos18^\circ = 0$

v- Prove that $\frac{Cos11^\circ + Sin11^\circ}{Cos11^\circ - Sin11^\circ} = \tan 56^\circ$

vi- Prove the identity $\frac{1-Cos\alpha}{Sin\alpha} = \tan\frac{\alpha}{2}$

vii- Find the period of $Cos\frac{X}{6}$

viii- A man 18dm tall observes that angle of elevation of top of tree at a distance of 12m from man is 32°. What is height of tree

ix- Show that $r_1r_2r_3 = rS^2$

x- Solve triangle ABC, given that $\alpha = 35°17', \beta = 45°13', b = 421$

xi- Without using table/calculator, Find $Cot^{-1}(-1)$

xii- Solve equation $1+\cos x = 0$

xiii- Find the value of 'θ' satisfying equation $4Sin^2\theta - 8Cos\theta + 1 = 0$

SECTION – II

Note: Attempt any three questions from the following. **10 x 3 = 30**

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

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

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

6- **(a)** Resolve $\frac{4x^2}{(x^2+1)^2(x-1)}$ into partial fraction.

(b) If three consecutive numbers in A.P are increased by 1, 4, 15 respectively, the resulting numbers are in G.P. Find the original numbers if their sum is 6

7- **(a)** A die is thrown. Find the probability that the dots on the top are prime numbers or odd numbers.

(b) If $2y = \frac{1}{2^2} + \frac{1\times3}{2!}\cdot\frac{1}{2^4} + \frac{1\times3\times5}{3!}\cdot\frac{1}{2^6} + \ldots\ldots\ldots$ then prove that $4y^2+4y-1=0$

8- **(a)** Find the values of the remaining trigonometric functions. If $Cos\theta = \frac{9}{41}$ and the terminal arm of the angle is in Quadrant IV

(b) Prove without using tables/calculator that $Sin19°Cos11° + Sin71°Sin11° = \frac{1}{2}$

9- **(a)** Measures of two sides of a triangle are in ratio 3 : 2 and they include an angle of measure 57°. Find the remaining two angles.

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

Inter. (Part-I)-A- 2021

Roll No._____ to be filled in by the candidate. (For all sessions) | Paper Code | 6 | 1 | 9 | 1 |

Mathematics (Objective Type)

Time: 30 Minutes Marks: 20

NOTE: Write answers to the questions on objective answer sheet provided. Four possible answers A,B,C & 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. Multiplicative identity of complex number is:

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

2. The contrapositive of $\sim p \rightarrow \sim q$ is:

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

3. If A and B are any two non singular matrices then $(AB)^{-1} =$

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

4. For a non-singular matrix A if X A=B then $X =$

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

5. If $f(x) = 3x^4 + 4x^3 + x - 5$ is divided by $x+1$, then remainder is:

(A) -8 (B) 7 (C) 6 (D) -7

6. If w is cue root of unity, then $w^{15} =$

(A) 1 (B) 0 (C) w (D) -w

7. Partial fraction of $\frac{3x-11}{(x^2+1)(x+3)}$ will be of the form.

(A) $\frac{Ax+B}{x^2+1} + \frac{C}{x+3}$ (B) $\frac{A}{x^2+1} + \frac{Bx+C}{x+3}$ (C) $\frac{Ax+B}{x+3} + \frac{C}{x^2+1}$ (D) $\frac{A}{x^2+1} + \frac{B}{x+3}$

8. If $a_n = (-1)^{n+1}$, then 26th term is:

(A) 1 (B) -1 (C) 26 (D) -26

9. $(n+1)^{th}$ term of G.P is:

(A) $a_1 r^{n-1}$ (B) $a_1 r^{n+1}$ (C) $a_1 r^{n+2}$ (D) $a_1 r^n$

10. n^{th} term of A.P is:

(A) $a_1(n-1)d$ (B) $a_1 + (n+1)d$ (C) $2a_1 + (n-1)d$ (D) $a_1 + (2n-1)d$

11. With usual notation $^nC_r + {}^nC_{r-1} =$

(A) $^nC_{r+1}$ (B) $^{n+1}C_r$ (C) $^{n-1}C_{r-1}$ (D) $^{n+1}C_{r-1}$

12. In the expansion of $(a+b)^7$, the second term is:

(A) a^7 (B) $7a^6b$ (C) $7ab^6$ (D) B

13. In one hour, the hour hand of a clock turns through an angle.

(A) $\frac{\pi}{8}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

14. $3\frac{\pi}{4}$ radian is equal to:

(A) 110^0 (B) 135^0 (C) 150^0 (D) 130^0

15. $\sin(-300^0) =$

(A) $-\frac{\sqrt{3}}{2}$ (B) $\frac{\sqrt{3}}{2}$ (C) $\frac{1}{2}$ (D) 0

16. Period of $\sin x$ is:

(A) π (B) 2π (C) 3π (D) $-\pi$

17. Radius of escribed circle opposite to vertex C is:

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

18. With usual notation $a+b-c =$

(A) $2S$ (B) $2S-2C$ (C) $2S-2b$ (D) $2S-c$

19. $2\tan^{-1} A =$

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

20. Solution of $\cot\theta = \frac{1}{\sqrt{3}}$ in quadrant III is:

(A) $\frac{5\pi}{3}$ (B) $7\frac{\pi}{6}$ (C) $\frac{4\pi}{3}$ (D) $\frac{7\pi}{3}$

Roll No._____ *to be filled in by the candidate.*

(For all sessions)

Mathematics (Essay Type)

Time: 2:30 Hours **Marks: 80**

RwP-21

Section -I

2. Write short answers of any eight parts from the following. **2x8=16**

i. Seperate into real and imaginary parts $\frac{2-7i}{4+5i}$.

ii. Factorize $3x^2+3y^2$.

iii. Simplify $(2,6)(3,7)$.

iv. Let $A=\{1,2,3,4\}$, Find the relation $\{(x,y)/\, x+y<5\}$ in A

v. Write the inverse and converse of $\sim p \rightarrow \sim q$

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

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

viii. Evaluate $(1+w+w^2)(1-w+w^2)$.

ix. Solve the equation $ax=b$ where a,b are the elements of a group G

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

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

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

3. Write short answers of any eight parts from the following. **2x8=16**

i. Which term of the A.P, -2,4,10,.....is 148?

ii. Insert three G.M's between 1 and 16.

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

iv. Find the value of n, when ${}^{n}P_4 : {}^{n-1}P_3 = 9:1$

v. If 5 is the harmonic mean between 2 and b, find b.

vi. Find the number of diagonals of a 6-sided figure.

vii. Evaluate $\sqrt[3]{30}$ correct to two places of decimals.

viii. Expand by binomial theorem $\left(\sqrt{\frac{a}{x}}-\sqrt{\frac{x}{a}}\right)^3$.

ix. Resolve into partial fractions $\frac{7x+25}{(x+3)(x+4)}$.

x. Resolve into partial fractions without finding the constants $\frac{9x-7}{(x^2+1)(x+3)}$

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

xii. Check whether, $1+\frac{1}{2}+\frac{1}{4}+.....+\frac{1}{2^{n-1}}=2\left(1-\frac{1}{2^n}\right)$ is true for $n=1,2$.

R

Rwp-21

4. Write short answers of any nine parts from the following. **2x9=18**

i. Prove that $\sec^2\theta - \operatorname{cosec}^2\theta = \tan^2\theta - \cot^2\theta$.

ii. Find the values of $\cos 105^0$ taking $(105^0 = 45^0 + 60^0)$.

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

iv. Find the period of $\tan(4x)$.

v. Show that $\gamma = (s-c)\tan\left(\dfrac{\gamma}{2}\right)$.

vi. In $\triangle ABC$ a=3,b=6 and B=36^{0}20' Find "b".

vii. Find area of $\triangle ABC$ if a=18, b=24 and c=30.

viii. Find the value of $\cos^{-1}\left(\dfrac{-1}{2}\right)$.

ix. Solve the equation $1+\cos x = 0$.

x. Find the soln of equation $\sec x = -2$ which lies in $[0, 2\pi]$.

xi. What is the circular measure of the angle between the hands of a watch at 4 'o' clock.

xii. Find the values of remaining trigonometric functions when $\cos\theta = \dfrac{9}{41}$ and the terminal arm of the angle is in quad Iv

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

Section -II

Note: Attempt any three questions from the following. **10x3=30**

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

(b) Solve the system of equations $x + y = 5$; $\dfrac{2}{x} + \dfrac{3}{y} = 2$.

6. (a) Resolve $\dfrac{1}{(1-ax)(1-bx)(1-cx)}$ into partial fractions.

(b) For what value of n, $\dfrac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the positive Geometric Meam (G.M) between a and b.

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

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

8. (a) Two cities A and B lie on the equator such that their longitudes are 45^{0}E and 25^{0}W respectively. Find the distance between two cities, taking radius of earth as 6400 kms.

(b) Show that $\cos(\alpha+\beta)\cos(\alpha-\beta) = \cos^2\alpha - \sin^2\beta = \cos^2\beta - \sin^2\alpha$.

9. (a) The sides of a triangle are $x^2 + x + 1, 2x + 1$ and $x^2 - 1$. Prove that the greatest angle of the triangle is 120^0.

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