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

MATHEMATICS **(Academic Sessions 2019 – 2021 to 2022 – 2024)**

Q.PAPER – I (Objective Type) 223-1st Annual-(INTER PART – I) Time Allowed : 30 Minutes

GROUP – I Maximum Marks : 20

PAPER CODE = 6195 LHR-11-1-23

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 Sum of cube roots of unity is :

(A) $2i$ (B) -1 (C) 0 (D) 1

2 If $^{n}P_2 = 30$ then n = :

(A) 5 (B) 6 (C) 7 (D) 8

3 The modulus of complex number $1 - i\sqrt{3}$ is :

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

4 Arithmetic mean between $\sqrt{2}$ and $3\sqrt{2}$ is :

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

5 If a function $f : A \rightarrow B$ is such that Ran $f \subseteq B$ i.e. Ran $f \neq B$ then f is called :

(A) Into function (B) Onto function

(C) Injective function (D) Bijective function

6 Partial fractions of $\frac{x^2+1}{(x+1)(x-1)}$ are of the type :

(A) $\frac{A}{x+1} + \frac{B}{x-1}$ (B) $1 - \frac{A}{x+1} - \frac{B}{x-1}$

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

7 Quadratic equation whose roots are 2 and 3 :

(A) $x^2 - 5x + 6 = 0$ (B) $x^2 + 5x + 6 = 0$ (C) $x^2 - 5x - 6 = 0$ (D) $x^2 + 5x - 6 = 0$

8 If A is a square matrix of order 3 then $|KA| =$:

(A) $K|A|$ (B) $K^3|A|$ (C) $K^2|A|$ (D) $|A|$

9 7th term of the sequence 2, 6, 11, 17, ---- is :

(A) 24 (B) 26 (C) 30 (D) 32

10 The trivial solution of homogeneous linear equation is :

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

11 Domain of the function $y = \cot x$ is :

(A) $-\infty < x < +\infty$ (B) $-\infty < x < +\infty$, $x \neq \frac{(2n+1)\pi}{2}$, $n \in Z$

(C) $-1 \leq x \leq 1$ (D) $-\infty < x < +\infty$, $x \neq n\pi$, $n \in Z$

(Turn Over)

1-12	If A and B are overlapping events then $P(A \cup B) = ---$: (A) $P(A)+P(B)$ (B) $1-P(A)$ (C) $P(A)+P(B)-P(A \cap B)$ (D) $1-P(B)$
13	The solutions of $\cos ec\theta = 2$ which lie in $[0, 2\pi]$: (A) $\frac{4\pi}{3}, \frac{5\pi}{3}$ (B) $\frac{2\pi}{3}, \frac{4\pi}{3}$ (C) $\frac{\pi}{4}, \frac{3\pi}{4}$ (D) $\frac{\pi}{6}, \frac{5\pi}{6}$
14	$\cos\left(\frac{\pi}{2} - \beta\right) = ---$: (A) $-\sin\beta$ (B) $\sin\beta$ (C) $\cos\beta$ (D) $-\cos\beta$
15	$\cos^{-1}(-x) =$: (A) $\cos^{-1}x$ (B) $-\cos^{-1}x$ (C) $\pi - \cos^{-1}x$ (D) $2\pi - \cos^{-1}x$
16	2nd term in the expansion of $\left(\frac{a}{2} - \frac{2}{a}\right)^6$ is : (A) $\frac{a^6}{64}$ (B) $\frac{15}{4}a^2$ (C) -20 (D) $-\frac{3}{8}a^4$
17	If $\sin\theta = \frac{12}{13}$ and terminal arm is in quad – I then $\cos\theta = ----$: (A) $\frac{13}{5}$ (B) $\frac{-5}{13}$ (C) $\frac{5}{13}$ (D) $\frac{-13}{5}$
18	In any triangle with usual notations $\sin\frac{\gamma}{2} =$: (A) $\sqrt{\frac{(s-a)(s-b)}{ab}}$ (B) $\sqrt{\frac{(s-b)(s-c)}{bc}}$ (C) $\sqrt{\frac{(s-c)(s-a)}{ca}}$ (D) $\sqrt{\frac{s(s-c)}{ab}}$
19	If n is odd in the expansion of $(a+x)^n$ then number of middle term are : (A) 2 (B) 3 (C) 4 (D) 1
20	In law of cosine if $\beta = 90°$ then it reduces to : (A) $b^2+c^2=a^2$ (B) $c^2+a^2=b^2$ (C) $a^2+b^2=c^2$ (D) $c^2-a^2=b^2$

Roll No LHR-11-1-23 (To be filled in by the candidate)

(Academic Sessions 2019 – 2021 to 2022 – 2024)

MATHEMATICS — 223-1st 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) Show that $z^2+\bar{z}^2$ is a real number where $z \in C$

(ii) Find the multiplicative inverse of $1-2i$

(iii) Write the descriptive and tabular form of $\{x \mid x \in P \wedge x < 12\}$

(iv) Define disjunction.

(v) If a, b are elements of a group G, solve $ax = $ b

(vi) Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix} = \begin{bmatrix} y & 1 \\ -3 & 2x \end{bmatrix}$

(vii) Find the cofactors A_{12} and A_{22} if $A = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$

(viii) Without expansion show that $\begin{vmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{vmatrix} = 0$

(ix) Solve the equation $4^{1+x} + 4^{1-x} = 10$

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

(xi) If α, β are the roots of $ax^2+bx+c=0$, $a \neq 0$, find the value of $\alpha^2+\beta^2$

(xii) The sum of a positive number and its reciprocal is $\frac{26}{5}$. Find the number.

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

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

(ii) If $\frac{1}{a}, \frac{1}{b}$ and $\frac{1}{c}$ are in A.P. , show that $b = \frac{2ac}{a+c}$

(iii) Sum the series $(x-a)+(x+a)+(x+3a)+-----$ to n terms.

(iv) Find the 5th term of G.P 3, 6, 12, -----

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

(vi) Find the sum to n terms of the series whose nth term is $3n^2+n+1$

(vii) Find the value of n when ${}^{n}P_4 : {}^{n-1}P_3 = 9:1$

(viii) How many necklaces can be made from 6 beads of different colours?

(ix) Find the value of n, when ${}^{n}C_{10} = \frac{12 \times 11}{2!}$

(x) Verify the statement $1+2+4+------+2^{n-1} = 2^n - 1$ for $n = 1, 2$

(xi) Calculate by means of binomial theorem $(0.97)^3$ upto three decimal places.

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

(Turn Over)

CHR-11-1-23

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

(i) Convert $21.256°$ to the $D°M'S''$ form.

(ii) Verify $\sin 2\theta = 2\sin\theta\cos\theta$, when $\theta = 45°$

(iii) Prove the identity $\cos\theta + \tan\theta\sin\theta = \sec\theta$

(iv) Prove that $\sin(180° + \alpha)\sin(90° - \alpha) = -\sin\alpha\cos\alpha$

(v) Prove that $\dfrac{\cos 11° + \sin 11°}{\cos 11° - \sin 11°} = \tan 56°$

(vi) Find the values of $\cos 105°$

(vii) Find the period of $\sin\dfrac{x}{5}$

(viii) Find θ, if $\cos\theta = 0.9316$

(ix) Write any two laws of tangents.

(x) Find the value of R, if $a = 13$, $b = 14$, $c = 15$

(xi) Find the value of $\tan\left(\cos^{-1}\dfrac{\sqrt{3}}{2}\right)$

(xii) Define trigonometric equation. Give one example.

(xiii) Find the values of θ, satisfying the equation $2\sin^2\theta - \sin\theta = 0$; $\theta \in [0, 2\pi]$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Prove that $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} = 4abc$ 5

(b) Solve the equation $x^4 - 3x^3 + 4x^2 - 3x + 1 = 0$ 5

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

(b) Find the value of n and r when ${}^{n-1}C_{r-1} : {}^{n}C_{r} : {}^{n+1}C_{r+1} = 3:6:11$ 5

7. (a) If $\dfrac{1}{a}, \dfrac{1}{b}, \dfrac{1}{c}$ are in G.P. , show that the common ratio is $\pm\sqrt{\dfrac{a}{c}}$ 5

(b) Show that $\binom{n}{1} + \binom{n}{3} + \binom{n}{5} + \text{------} + \binom{n}{n-1} = 2^{n-1}$ 5

8. (a) Prove that $\dfrac{1}{\operatorname{cosec}\theta - \cot\theta} - \dfrac{1}{\sin\theta} = \dfrac{1}{\sin\theta} - \dfrac{1}{\operatorname{cosec}\theta + \cot\theta}$ 5

(b) Reduce $\sin^4\theta$ to an expression involving only function of multiples of θ, raised to first power. 5

9. (a) Solve the triangle using first law of tangents and then law of sines 5
$a = 36.21$, $b = 42.09$, $\gamma = 40°29'$

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