

Roll No \_\_\_\_\_ ( To be filled in by the candidate)

**MATHEMATICS** ( Academic Sessions 2020 – 2022 to 2023 – 2025 )

Q.PAPER – I ( Objective Type ) 224-1<sup>st</sup> Annual-(INTER PART – I) Time Allowed : 30 Minutes

GROUP – II

Maximum Marks : 20

PAPER CODE = 6196

LHR-2-24

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	If A is a matrix of order $2 \times 3$ , then order of $A'A$ is : (A) $3 \times 3$ (B) $2 \times 3$ (C) $3 \times 2$ (D) $2 \times 2$
2	The equation $x(x-1)=x^2-x$ is : (A) Conditional (B) Identity (C) Exponential (D) Radical
3	The multiplicative inverse of $-i$ is : (A) $(1, -1)$ (B) $(0, -1)$ (C) $(0, 1)$ (D) $(1, 0)$
4	If $\omega$ is a cube root of unity, then $(1+\omega+\omega^2)^8 =$ : (A) 0 (B) 256 (C) $256\omega$ (D) $256\omega^2$
5	Which of the following sets has closure property w.r.t. addition : (A) $\{1\}$ (B) $\{0\}$ (C) $\{0, 1\}$ (D) $\{1, -1\}$
6	If $ A =9$ , then $ A' $ is : (A) 81 (B) $\frac{1}{9}$ (C) -9 (D) 9
7	The converse of $p \rightarrow q$ is : (A) $\sim p \rightarrow \sim q$ (B) $\sim q \rightarrow p$ (C) $q \rightarrow p$ (D) $p \rightarrow \sim q$
8	If $A = \{\}$ , then the power set of A is : (A) $\phi$ (B) $\{0\}$ (C) $\{\}$ (D) $\{\phi\}$
9	If $4^{1+x}=2$ , then $x =$ : (A) 0 (B) -2 (C) $-\frac{1}{2}$ (D) $\frac{1}{2}$
10	If $A \cap B = A$ , then : (A) $B \subseteq A$ (B) $A \subseteq B$ (C) $A \cup B = A$ (D) $B \cup A = A$
11	$\sin(270^\circ + \theta) =$ : (A) $\sin \theta$ (B) $\cos \theta$ (C) $-\cos \theta$ (D) $-\sin \theta$
12	Which cannot be the term of a G.P. : (A) 1 (B) -1 (C) 0 (D) i

( Turn Over )

(2)

1-13	<p>If <math>\sin x = -\frac{\sqrt{3}}{2}</math>, then the reference angle is :</p> <p>(A) <math>-\frac{\pi}{6}</math>                      (B) <math>\frac{\pi}{6}</math>                      (C) <math>-\frac{\pi}{3}</math>                      (D) <math>\frac{\pi}{3}</math></p>
14	<p>Which angle is quadrantal angle :</p> <p>(A) <math>45^\circ</math>                      (B) <math>60^\circ</math>                      (C) <math>120^\circ</math>                      (D) <math>270^\circ</math></p>
15	<p>With usual notation, <math>\frac{abc}{4R} = :</math></p> <p>(A) <math>r</math>                      (B) <math>r_1</math>                      (C) <math>\Delta</math>                      (D) <math>r_2</math></p>
16	<p>H.M. between 3 and 7 is :</p> <p>(A) 5                      (B) <math>\sqrt{21}</math>                      (C) <math>\pm\sqrt{21}</math>                      (D) <math>\frac{21}{5}</math></p>
17	<p>The number of terms in the expansion of <math>(a+x)^n</math> is :</p> <p>(A) <math>n-1</math>                      (B) <math>n</math>                      (C) <math>n+2</math>                      (D) <math>n+1</math></p>
18	<p>The period of <math>\cos 2x</math> is :</p> <p>(A) <math>\pi</math>                      (B) <math>2\pi</math>                      (C) <math>4\pi</math>                      (D) <math>\frac{\pi}{2}</math></p>
19	<p>If <math>r=n</math>, then <math>{}^nC_r = :</math></p> <p>(A) 0                      (B) 1                      (C) <math>n</math>                      (D) <math>n!</math></p>
20	<p><math>\sin^{-1}(0) + \cos^{-1}(0) = :</math></p> <p>(A) 0                      (B) <math>\frac{\pi}{2}</math>                      (C) <math>\frac{\pi}{3}</math>                      (D) <math>\frac{\pi}{4}</math></p>

25-224-II-(Objective Type)- 11750 (6196)

Roll No \_\_\_\_\_

( To be filled in by the candidate )

( Academic Sessions 2020 – 2022 to 2023 – 2025 )

MATHEMATICS

224-1<sup>st</sup> Annual-(INTER PART – I)

Time Allowed : 2.30 hours

PAPER – I ( Essay Type )

GROUP – II

Maximum Marks : 80

SECTION – I

LHR-2-24

2. Write short answers to any EIGHT (8) questions :

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- (i) Show that  $z^2 \bar{z}^2$  is a real number.
- (ii) Find the modulus of  $1 - i\sqrt{3}$
- (iii) Simplify by justifying each step  $\frac{\frac{1}{4} + \frac{1}{5}}{\frac{1}{4} - \frac{1}{5}}$
- (iv) Check the closure property w.r.t. addition and multiplication for the set  $\{0, -1\}$
- (v) Determine whether the statement  $p \wedge \sim p$  is tautology or not.
- (vi) Define semi-group.
- (vii) If  $A = \begin{bmatrix} 1 \\ 1+i \\ i \end{bmatrix}$ , find  $A(\bar{A})^t$
- (viii) Define reduced echelon form of a matrix, with example.
- (ix) If  $A = \begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix}$ , verify that  $(A^{-1})^t = (A^t)^{-1}$
- (x) Discuss nature of roots of  $9x^2 - 12x + 4 = 0$
- (xi) Solve the equations  $x^2 + y^2 = 25$ ,  $2x^2 + 3y^2 = 6$
- (xii) Find the condition that one root of  $x^2 + px + q = 0$  is square of other.

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

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- (i) Define proper rational fraction.
- (ii) For the identity  $\frac{1}{(x-1)(2x-1)(3x-1)} = \frac{A}{x-1} + \frac{B}{2x-1} + \frac{C}{3x-1}$  calculate the value of A.
- (iii) Find the next two terms of 1, 3, 7, 15, 31, ----
- (iv) How many terms are there in the A.P. in which  $a_1 = 11$ ,  $a_n = 68$ ,  $d = 3$
- (v) Find three A.Ms between  $\sqrt{2}$  and  $3\sqrt{2}$ .
- (vi) Find the 12<sup>th</sup> term of  $1+i$ ,  $2i$ ,  $-2+2i$ , ----
- (vii) Show that  ${}^{16}C_{11} + {}^{16}C_{10} = {}^{17}C_{11}$
- (viii) Evaluate  ${}^{12}C_3$
- (ix) What is sample space and events?
- (x) State principle of mathematical induction.
- (xi) Calculate  $(9.98)^4$  by means of binomial theorem.
- (xii) Prove that  $n! > 2^n - 1$  for  $n = 4, 5$

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

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- (i) What is length of an arc intercepted on a circle of radius 14 cm by the arms of a central angle  $45^\circ$ ?
- (ii) Convert  $54^\circ 45'$  into radians.

(Turn Over)

(2)

4. (iii) If  $\alpha, \beta, \gamma$  are angles of triangle ABC then prove that  $\cos\left(\frac{\alpha + \beta}{2}\right) = \sin\frac{\gamma}{2}$
- (iv) Find the value of  $\cos\frac{\pi}{12}$
- (v) Express  $\sin(x + 30^\circ) + \sin(x - 30^\circ)$  as a product.
- (vi) Define periodic function and period of trigonometric function.
- (vii) Find period of  $\cos\frac{x}{6}$
- (viii) Draw the graph of  $y = \sin x$  from 0 to  $\pi$ .
- (ix) State law of sines.
- (x) If sides of triangle are 16, 20, 23, find its greatest angle.
- (xi) Show that  $r_1 = s \tan\frac{\alpha}{2}$
- (xii) Find value of  $\cos\left(\sin^{-1}\frac{1}{\sqrt{2}}\right)$
- (xiii) Show that  $\tan\left(\sin^{-1}x\right) = \frac{x}{\sqrt{1-x^2}}$

## SECTION - II

**Note :** Attempt any THREE questions.

5. (a) Solve the system of equations by Cramer's rule : 5  
$$\begin{aligned} 2x + 2y + z &= 3 \\ 3x - 2y - 2z &= 1 \\ 5x + y - 3z &= 2 \end{aligned}$$
- (b) If  $\alpha, \beta$  roots of  $x^2 - 3x + 5 = 0$  form the equation whose roots are  $\frac{1-\alpha}{1+\alpha}$  and  $\frac{1-\beta}{1+\beta}$  5
6. (a) Resolve  $\frac{x^4}{1-x^4}$  into partial fractions 5
- (b) The sum of an infinite geo-metric series is 9 and the sum of the squares of its terms is  $\frac{81}{5}$ . Find the series. 5
7. (a) Find the values of  $n$  and  $r$  when  ${}^{n-1}C_{r-1} : {}^nC_r : {}^{n+1}C_{r+1} = 3:6:11$  5
- (b) If  $x$  is so small that its cube and higher powers can be neglected, then show that :  $\sqrt{\frac{1-x}{1+x}} \approx 1 - x + \frac{x^2}{2}$  5
8. (a) Reduce  $\cos^4 \theta$  to an expression involving only function of multiples of  $\theta$ , raised to the first power. 5
- (b) Prove that  $r_3 = 4R \cos\frac{\alpha}{2} \cos\frac{\beta}{2} \sin\frac{\gamma}{2}$  5
9. (a) Show that the area of a sector of a circular region of radius  $r$  is  $\frac{1}{2}r^2\theta$ , where  $\theta$  is the circular measure of the central angle of the sector. 5
- (b) Prove that  $\sin^{-1}\frac{1}{\sqrt{5}} + \cot^{-1}3 = \frac{\pi}{4}$  5