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 – II   Maximum Marks : 20

PAPER CODE = 6192 LHR-11-2-23

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	The multiplicative inverse of $(1,0)$ is :			
	(A) 0	(B) 1	(C) $(1,0)$	(D) $(0,1)$
2	Which one of them is unary operation :			
	(A) Addition	(B) Multiplication	(C) Subtraction	(D) Negation
3	If A is a square matrix of order 3×3 then $\lvert KA \rvert$ = :			
	(A) $K\lvert A\rvert$	(B) $K^2\lvert A\rvert$	(C) $K^3\lvert A\rvert$	(D) $K^9\lvert A\rvert$
4	A square matrix $A=[a_{ij}]$ is called a skew-symmetric if :			
	(A) $A^t = A^`$	(B) $A^t = -A$	(C) $A^t = \pm A$	(D) $A^{-1} = A$
5	Roots of quadratic equation $x^2 - 7x + 10 = 0$ are :			
	(A) 2 , 5	(B) -2 , 5	(C) 2 , -5	(D) -2 , -5
6	Product of all three cube roots of unity is :			
	(A) i	(B) $-i$	(C) 1	(D) -1
7	Types of rational fractions are :			
	(A) 1	(B) 2	(C) 3	(D) 4
8	A.M. between $x-3$ and $x+5$ is :			
	(A) $x+1$	(B) $2x+1$	(C) $2x+2$	(D) 2
9	G.M. between 1 and 16 is :			
	(A) -5	(B) 4	(C) 6	(D) 8
10	P(E) represents the probability of an event " E " and $0 \leq P(E) \leq 1$ for P(E) = 0 the event will be :			
	(A) Certain	(B) One	(C) Possible	(D) Impossible
11	The probability that an event does not occur, $P(\bar{E})$ = :			
	(A) $1-P(E)$	(B) $1+P(E)$	(C) $2-P(E)$	(D) $2+P(E)$
12	The total number of terms in the expansion of $(a+x)^n$ is :			
	(A) $n+2$	(B) $n+1$	(C) n	(D) $n-1$
13	The statement $n^2 > n+3$ hold for n = :			
	(A) 0	(B) 1	(C) 2	(D) 3

(Turn Over)

14	$\frac{2\pi}{3}$ radian in degree is :			
	(A) 75°	(B) 100°	(C) 110°	(D) 120°
15	$1 - 2\sin^2 \alpha =$:			
	(A) $\sin 2\alpha$	(B) $\sin \frac{\alpha}{2}$	(C) $\cos 2\alpha$	(D) $\cos \alpha$
16	The period of tangent function is :			
	(A) $\frac{\pi}{4}$	(B) $\frac{\pi}{2}$	(C) $\frac{\pi}{3}$	(D) π
17	$\sqrt{s(s-a)(s-b)(s-c)} =$:			
	(A) r	(B) Δ	(C) Δs	(D) r_1
18	$\frac{\Delta}{s} =$:			
	(A) r	(B) r_1	(C) r_2	(D) r_3
19	$\cos^{-1}\left(\frac{1}{2}\right) =$:			
	(A) $\frac{\pi}{3}$	(B) $\frac{\pi}{4}$	(C) $\frac{\pi}{6}$	(D) $\frac{\pi}{2}$
20	Solution of the equation $\sin x = \frac{1}{2}$ in $[0, 2\pi]$ is :			
	(A) $\frac{\pi}{2}$	(B) $\frac{\pi}{6}$	(C) $\frac{\pi}{4}$	(D) $\frac{\pi}{3}$

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

- (i) Show that $\forall z \in C$, $(z - \bar{z})^2$ is a real number.

(ii) Simplify $(a + bi)^{-2}$

(iii) Write the power set of $\{+, -, \times, \div\}$

(iv) Write the converse, inverse of $\sim p \to q$

(v) Just, convert $(A \cup B)' = A' \cap B'$ and $(A \cap B)' = A' \cup B'$ into logical form.

(vi) If $A = \begin{bmatrix} 1 & 2 \\ a & b \end{bmatrix}$ and $A^2 = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$, find the values of a and b

(vii) Solve the equations $\begin{array}{l} 2x_1 - 3x_2 = 5 \\ 5x_1 + x_2 = 4 \end{array}$

(viii) Define cofactor of an element of matrix.

(ix) Solve the equation $x^3 + x^2 + x + 1 = 0$

(x) If α , β are the roots of $x^2 - px - p - c = 0$, prove that $(1 + \alpha)(1 + \beta) = 1 - c$

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

(xii) Give the statement of factor theorem.

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

(i) Without finding constants, write $\dfrac{9x - 7}{(x^2 + 1)(x + 3)}$ into partial fraction form.

(ii) If $a_{n-3} = 2n - 5$, find nth term of A.P.

(iii) Sum the series $3 + 5 - 7 + 9 + 11 - 13 + 15 + 17 - 19 + \cdots + 3n$ terms.

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

(v) If 5 is the H.M. between 2 and b, find the value of b.

(vi) Write formula for $\displaystyle\sum_{k=1}^{n} k$ and $\displaystyle\sum_{k=1}^{n} k^3$

(vii) If $^{11}P_n = 11.10.9$, then find n

(viii) How many signals can be given by 5 flags of different colours using 3 flags at a time?

(ix) A die is thrown twice. What is the probability that sum of dots shown is either 3 or 11?

(x) Using binomial theorem, expand $\left(3a - \dfrac{x}{3a}\right)^4$

(xi) Find middle term in the expansion of $\left(\dfrac{x}{2} + \dfrac{2}{x^2}\right)^{12}$

(xii) Expand $(1 - 2x)^{1/3}$ upto first three terms.

(Turn Over)

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

(i) Define angle in the standard position.

(ii) If $\tan\theta = -\dfrac{1}{3}$ and the terminal arm of angle is in second quadrant then find $\sec\theta$

(iii) Find $\sin\theta$ and $\cos\theta$ for $\theta = \dfrac{19\pi}{3}$

(iv) If α, β, γ are angles of triangle ABC then prove $\sin(\alpha+\beta) = \sin\gamma$

(v) Without calculator or table, find $\cos(75°)$

(vi) Prove that $\tan(45°+A)\tan(45°-A) = 1$

(vii) Define period of a trigonometric function.

(viii) Solve the right triangle ABC in which $r = 90°$, $a = 3.28$, $b = 5.74$

(ix) By using the law of cosine, write the formula of $\cos\alpha$ and $\cos\beta$

(x) Solve the triangle ABC if $\beta = 60°$, $\gamma = 15°$ and $b = \sqrt{6}$

(xi) Define the principal sin function.

(xii) Solve the equation $\sin x = \dfrac{1}{2}$

(xiii) Solve the equation $\sin x + \cos x = 0$ and find its general solution set.

SECTION – II

Note : Attempt any THREE questions.

5. (a) If $A = \begin{bmatrix} i & 1+i \\ 1 & -i \end{bmatrix}$ show that $A - (\bar{A})^t$ is skew-hermitian. 5

(b) When $x^4 + 2x^3 + kx^2 + 3$ is divided by $x-2$ and remainder is 1, find the value of k. 5

6. (a) Resolve into partial fraction $\dfrac{1}{(x-1)^2(x+1)}$ 5

(b) Prove that $^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$ 5

7. (a) Find 'n' so that $\dfrac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be H.M. between a and b 5

(b) Find $(2n+1)$th term from the end in expansion of $\left(x - \dfrac{1}{2x}\right)^{3n}$ 5

8. (a) If $\tan\theta = \dfrac{1}{\sqrt{7}}$ and the terminal arm of the angle is not in the III quad., find the value of $\dfrac{\csc^2\theta - \sec^2\theta}{\csc^2\theta + \sec^2\theta}$ 5

(b) Prove that $\cos 20° \cos 40° \cos 60° \cos 80° = \dfrac{1}{16}$ 5

9. (a) Solve the triangle ABC if $a = 7$, $b = 3$, $\gamma = 38°13'$ 5

(b) Prove that $\tan^{-1}\dfrac{3}{4} + \tan^{-1}\dfrac{3}{5} - \tan^{-1}\dfrac{8}{19} = \dfrac{\pi}{4}$ 5