LHR. G2-11.19

oll No _____ (To be filled in by the candidate)

(Academic Sessions 2015 – 2017 to 2018 – 2020)

MATHEMATICS 219-(INTER PART – I) Time Allowed : 2.30 hours

PAPER – I (Essay Type) GROUP – II Maximum Marks : 80

SECTION – I

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

(i) Prove the rule of addition $\frac{a}{c}+\frac{b}{c}=\frac{a+b}{c}$

(ii) Find the multiplicative inverse of $\left(\sqrt{2}, -\sqrt{5}\right)$

(iii) Express the complex number $1+i\sqrt{3}$ in polar form.

(iv) Write the power set of $\{a,\{b,c\}\}$

(v) Show that the statement $p \rightarrow (p \vee q)$ is tautology.

(vi) Prove that the identity element e in a group G is unique.

(vii) If $A=\begin{bmatrix}1 & -1\\ a & b\end{bmatrix}$ and $A^2=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$, find a and b

(viii) If $B=\begin{bmatrix}5 & -2 & 5\\ 3 & -1 & 4\\ -2 & 1 & -2\end{bmatrix}$. find cofactor B_{21}

(ix) If A is a skew-symmetric matrix, then show that A^2 is a symmetric matrix

(x) Solve $x^{-2}-10=3x^{-1}$.

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

(xii) Discuss the nature of roots of the equation $x^2-5x+6=0$

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

(i) Define proper fraction.

(ii) If $\frac{x^2-10x+13}{(x-1)(x^2-5x+6)}=\frac{A}{x-1}+\frac{B}{x-2}+\frac{C}{x-3}$, find value of A

(iii) If $\frac{x}{(x-a)(x-b)(x-c)}=\frac{A}{x-a}+\frac{B}{x-b}+\frac{C}{x-c}$, find value of B

(iv) If the numbers $\frac{1}{k}, \frac{1}{2k+1}$ and $\frac{1}{4k-1}$ are in harmonic sequence, find k

(v) Find sum of infinite geometric series 2 + 1 + 0.5 + ----

(vi) Define geometric mean.

(vii) If 5, 8 are two A.Ms between a and b , find a and b

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

(ix) Prove that ${}^nC_r={}^nC_{n-r}$

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

(xi) Evaluate $\sqrt[3]{30}$ correct to three places of decimal.

(xii) Check whether the statement 5^n-2^n is divisible by 3 for n = 2 , 3 is true or false.

(Turn Over)

LHR-GZ-11-19

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

(i) Find r , when $\ell = 56cm, \theta = 45°$

(ii) Find the values of all trigonometric functions for -15π

(iii) Prove that $\frac{1-\sin\theta}{\cos\theta} = \frac{\cos\theta}{1+\sin\theta}$

(iv) Express the difference $\cos 7\theta - \cos\theta$ as product.

(v) Prove $\frac{1-\cos\alpha}{\sin\alpha} = \tan\frac{\alpha}{2}$

(vi) Find the value of $\cos 105°$ without using calculator.

(vii) Find the period of $3\sin\frac{2x}{5}$

(viii) With usual notations prove that $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$

(ix) Define in-circle of the triangle ABC.

(x) State the law of tangent. (any two)

(xi) Show that $\cos(2\sin^{-1}x) = 1 - 2x^2$

(xii) Solve the equation for $\theta \in [0, \pi]$ $\cot^2\theta = \frac{4}{3}$

(xiii) Solve the equation for $\theta \in [0, \pi]$ $2\sin\theta + \cos^2 - 1 = 0$

SECTION – II

Note : Attempt any THREE questions.

5. (a) If G is a group under the operation " ※ " and $a, b \in G$, find the solutions of the equations : (i) $a ※ x = b$ (ii) $x ※ a = b$ 5

(b) If 7^{th} and 10^{th} terms of an H.P are $\frac{1}{3}$ and $\frac{5}{21}$ respectively, find its 14^{th} term 5

6. (a) Show that $\begin{vmatrix} a+\ell & a & a \\ a & a+\ell & a \\ a & a & a+\ell \end{vmatrix} = \ell^2(3a+1)$ 5

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

7. (a) If α, β are the roots of $5x^2 - x - 2 = 0$ form the equation whose roots are $\frac{3}{\alpha}$ and $\frac{3}{\beta}$ 5

(b) Use mathematical induction to prove that $n! > n^2$ for integral values of $n \geq 4$. 5

8. (a) A railway train is running on a circular track of radius 500 meters at the rate of 30 km per hour. Through what angle will it turn in 10 sec? 5

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

9. (a) Prove that $r_1r_2 + r_2r_3 + r_3r_1 = s^2$ 5

(b) Prove that $\tan^{-1}A + \tan^{-1}B = \tan^{-1}\frac{A+B}{1-AB}$ 5

LHR-G2-11.19

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

MATHEMATICS - (Academic Sessions 2015 – 2017 to 2018 – 2020)

Q.PAPER – I (Objective Type) 219-(INTER PART – I) Time Allowed : 30 Minutes

GROUP – II Maximum Marks : 20

PAPER CODE = 6194

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	$\cos\left(\frac{3\pi}{2}-\theta\right)$ is equal to :			
	(A) $-\sin\theta$	(B) $\sin\theta$	(C) $\cos\theta$	(D) $-\cos\theta$
2	Probability of impossible event is :			
	(A) $\frac{1}{2}$	(B) 1	(C) 0	(D) 2
3	$2\tan^{-1}A$ equals :			
	(A) $\tan^{-1}\left(\frac{A}{1-A^2}\right)$	(B) $\tan^{-1}\left(\frac{2A}{1-A^2}\right)$		
	(C) $\tan^{-1}\left(\frac{2A}{1+A^2}\right)$	(D) $\tan^{-1}\left(\frac{A}{1+A^2}\right)$		
4	Which angle is quadrantal angle :			
	(A) 45°	(B) 60°	(C) 270°	(D) 120°
5	Solution of equation $\tan x=\frac{1}{\sqrt{2}}$ lies in the quadrants :			
	(A) I and II	(B) II and III	(C) I and III	(D) I and IV
6	Middle terms in the expansion of $(x+y)^{11}$ are :			
	(A) T_6, T_7	(B) T_5, T_6	(C) T_7, T_8	(D) T_8, T_9
7	If Δ is the area of a triangle ABC, then with usual notation $\Delta =$:			
	(A) $\frac{1}{2}bc\sin\beta$	(B) $\frac{1}{2}ab\sin\alpha$	(C) $\frac{1}{3}bc\sin\alpha$	(D) $\frac{1}{2}bc\sin\alpha$
8	Range of cotangent function is :			
	(A) N	(B) Z	(C) R	(D) C
9	Expansion of $(3-5x)^{\frac{1}{2}}$ is valid if :			
	(A) $\lvert x\rvert<\frac{3}{5}$	(B) $\lvert x\rvert<\frac{5}{3}$	(C) $\lvert x\rvert<5$	(D) $\lvert x\rvert<3$
10	With usual notation R = :			
	(A) $\frac{b}{2\sin\gamma}$	(B) $\frac{a}{2\sin\alpha}$	(C) $\frac{c}{2\sin\alpha}$	(D) $\frac{a}{2\sin\beta}$
11	The sum of the four fourth roots of 81 is :			
	(A) 0	(B) 81	(C) – 81	(D) 3

(Turn Over)

LHR-GL-11-19

1-12	The property $\forall a,b \in \mathcal{R}$, $a=b \Rightarrow b=a$ is called : (A) Commutative (B) Transitive (C) Symmetric (D) Reflexive
13	The value of $4!.0!.1!$ is : (A) 0 (B) 1 (C) 4 (D) 24
14	A square matrix $A=[a_{ij}]$ in which $a_{ij}=0$ for all $i>j$ is called : (A) Upper triangular (B) Lower triangular (C) Symmetric (D) Skew-symmetric
15	$\sum_{k=1}^{n}(1)^k =$: (A) $\frac{n(n-1)}{2}$ (B) $\frac{n}{2}$ (C) n (D) $\frac{n(n+1)}{2}$
16	If $b^2-4ac>0$ but not a perfect square, then roots are : (A) Equal (B) Complex (C) Rational (D) Irrational
17	No term of geometric sequence can be : (A) 0 (B) 1 (C) 2 (D) 3
18	If A and B are two sets, then A – B = : (A) $A \cup B^c$ (B) $A \cap B^c$ (C) $(A \cup B)^c$ (D) $(A \cap B)^c$
19	Partial fractions of $\frac{1}{x^3-1}$ will be of the form : (A) $\frac{A}{x+1}+\frac{Bx+C}{x^2+x+1}$ (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) $\frac{A}{x+1}+\frac{Bx+C}{x^2-x+1}$
20	If $A=[a_{ij}]_{2\times 2}$, then $\lvert kA\rvert =$: (A) $\lvert A\rvert$ (B) $k^2\lvert A\rvert$ (C) $k\lvert A\rvert$ (D) $k\lvert A\rvert^2$