LHR-01-11.19

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

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

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

GROUP – I Maximum Marks : 20

PAPER CODE = 6195

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 $x-a$ is a factor of polynomial $f(x)$, then $f(a)$ is :			
	(A) $=0$	(B) <0	(C) >0	(D) $\neq 0$
2	If ${}^nC_5={}^nC_4$, then n is :			
	(A) 9	(B) 7	(C) 6	(D) 5
3	The multiplicative inverse of $(1,-2)=$:			
	(A) $(\frac{1}{5},\frac{-2}{5})$	(B) $(\frac{-1}{5},\frac{-2}{5})$	(C) $(\frac{1}{5},\frac{2}{5})$	(D) $(\frac{-1}{5},\frac{2}{5})$
4	9th term in the sequence $\frac{1}{3},\frac{1}{5},\frac{1}{7},----$ is :			
	(A) $\frac{1}{13}$	(B) $\frac{1}{15}$	(C) $\frac{1}{17}$	(D) $\frac{1}{19}$
5	The contrapositive of $\sim p \rightarrow \sim q$ is :			
	(A) $p \rightarrow q$	(B) $q \rightarrow p$	(C) $\sim q \rightarrow \sim p$	(D) $\sim q \rightarrow p$
6	From the identity $5x+4=A(x-1)+B(x+2)$, then value of B = :			
	(A) -3	(B) 3	(C) -2	(D) 2
7	The sum of four 4^{th} roots of 16 is :			
	(A) 0	(B) 2	(C) 4	(D) 16
8	If $\begin{bmatrix} x-3 & 1 \\ -5 & -4 \end{bmatrix}=\begin{bmatrix} 2 & 1 \\ -5 & -4 \end{bmatrix}$, then $x=$:			
	(A) 5	(B) -5	(C) -1	(D) 1
9	The arithmetic mean between $\sqrt{2}$ and $3\sqrt{2}$ is :			
	(A) $3\sqrt{2}$	(B) $2\sqrt{2}$	(C) $4\sqrt{2}$	(D) $\sqrt{2}$
10	If $A=\begin{bmatrix} 1 & 2 & -2 \\ 0 & 0 & 5 \\ 6 & 7 & 3 \end{bmatrix}$, then $A_{33}=$:			
	(A) -1	(B) 1	(C) 3	(D) 0
11	Period of $\cot\theta$ is :			
	(A) π	(B) 2π	(C) $\frac{\pi}{2}$	(D) $\frac{3\pi}{2}$

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LHR-G1-11.19 (2)

1-12	Number of signals can be made with 4 flags when one flag is used at a time are : (A) ${}^4C_0$ (B) ${}^4C_1$ (C) ${}^4C_2$ (D) ${}^4C_3$
13	The equation $\sin^2 x - \sec x = \frac{3}{4}$ is called : (A) Trigonometric equation (B) Linear equation (C) Quadratic equation (D) Quantic equation
14	$3\sin\alpha - 4\sin^3\alpha$ = : (A) $\sin\alpha$ (B) $\sin 2\alpha$ (C) $\sin 3\alpha$ (D) $\sin 4\alpha$
15	Domain of the function $y = \sin^{-1} x$ is : (A) $-\frac{\pi}{2} \le x \le \frac{\pi}{2}$ (B) $-1 \le y \le 1$ (C) $-1 \le x \le 1$ (D) $-\frac{\pi}{2} \le y \le \frac{\pi}{2}$
16	Francesco Mourolico devised the method of : (A) Partial fraction (B) Induction (C) Logarithms (D) Binomial
17	If $\ell = 35$ cm and $\theta = 1$ rad, then r = : (A) 35° (B) 35 cm (C) 35 rad (D) 35 m
18	In any ΔABC with usual notations, $\frac{\Delta}{s-c}$ = : (A) r (B) r_1 (C) r_2 (D) r_3
19	The general term in the expansion of $(a+x)^n$ is : (A) $\binom{n}{a} a^{n-r} x^r$ (B) $\binom{n}{x} a^{n-r} x^r$ (C) $\binom{n}{r} a^{n-r} x^r$ (D) $\binom{n}{r} a^{n-r} x$
20	If sides of a ΔABC are $a = 4584$, $b = 5140$ and $c = 3624$, then greatest angle will be : (A) α (B) β (C) γ (D) a

LHR-G1-11.19

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(Academic Sessions 2015 – 2017 to 2018 – 2020)

MATHEMATICS 219-(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) If z_1 and z_2 are complex numbers then show that $\overline{z_1 + z_2} = \overline{z_1} + \overline{z_2}$

(ii) Find out real and imaginary parts of $(\sqrt{3}+i)^3$

(iii) Factorize $a^2 + 4b^2$

(iv) Define power set of a set and give an example.

(v) Define a bijective function.

(vi) Construct truth table and show that the statement $\sim(p \to q) \to p$ is a tautology or not.

(vii) Find the matrix X if $X\begin{bmatrix} 5 & 2 \\ -2 & 1 \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 12 & 3 \end{bmatrix}$

(viii) For the matrix $A = \begin{bmatrix} 1 & -2 & 3 \\ -2 & 3 & 1 \\ 4 & -3 & 2 \end{bmatrix}$ find cofactor A_{12}

(ix) Without expansion show that $\begin{vmatrix} \alpha & \beta+\gamma & 1 \\ \beta & \gamma+\alpha & 1 \\ \gamma & \alpha+\beta & 1 \end{vmatrix} = 0$

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

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

(xii) The sum of a positive number and its square is 380. Find the number.

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

(i) Define partial fraction.

(ii) In the identity $7x + 25 = A(x+4) + B(x+3)$, calculate values of A and B.

(iii) Resolve $\frac{1}{x^2-1}$ into partial fractions.

(iv) Write the first four terms of the sequence, if $a_n - a_{n-1} = n + 2$, $a_1 = 2$

(v) Which term of the arithmetic sequence 5, 2, – 1, ---- is – 85.

(vi) Find three A.Ms between 3 and 11.

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

(viii) Insert two G.Ms between 2 and 16.

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

(x) Show that $\frac{n^3 + 2n}{3}$ represents an integer for n = 2, 3.

(xi) Expand $\left(1 - \frac{3}{2}x\right)^{-2}$ upto 4 terms.

(xii) If x is so small that its square and higher power can be neglected, then show that $\frac{\sqrt{1+2x}}{\sqrt{1-x}} \approx 1 + \frac{3}{2}x$

(Turn Over)

LHR.G1.11.19

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

(i) Find ℓ, if $\theta = 65°20'$, r = 18 mm

(ii) Prove $\sin^2\frac{\pi}{6} : \sin^2\frac{\pi}{4} : \sin^2\frac{\pi}{3} : \sin^2\frac{\pi}{2} = 1:2:3:4$

(iii) Prove $\cos^2\theta - \sin^2\theta = \frac{1-\tan^2\theta}{1+\tan^2\theta}$

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

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

(vi) Prove $\cos 20° + \cos 100° + \cos 140° = 0$

(vii) Find the period of $\tan\frac{x}{7}$

(viii) In ΔABC, $\beta = 60°$, $\gamma = 15°$, $b = \sqrt{6}$, find c.

(ix) If $a = 200$, b = 120 , $\gamma = 150°$, find the area of a triangle ABC

(x) Prove that $r_1 r_2 r_3 = rs^2$

(xi) Prove $\sin(2\cos^{-1}x) = 2x\sqrt{1-x^2}$

(xii) Solve $1 + \cos x = 0$

(xiii) Find the solutions of $\sin x = -\frac{\sqrt{3}}{2}$ in $[0, 2\pi]$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Prove that all 2 × 2 non-singular matrices over the real field form a non-abelian group under multiplication. 5

(b) Find three, consecutive numbers in G.P whose sum is 26 and their product is 216. 5

6. (a) Find the inverse of the matrix $A = \begin{bmatrix} 2 & 5 & -1 \\ 3 & 4 & 2 \\ 1 & 2 & -2 \end{bmatrix}$ by using row operation. 5

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

7. (a) Solve the system of equations :

$12x^2 - 25xy + 12y^2 = 0$

$4x^2 + 7y^2 = 148$ 5

(b) If $y = \frac{1}{3} + \frac{1.3}{2!}(\frac{1}{3})^2 + \frac{1.3.5}{3!}(\frac{1}{3})^3 + \text{-----}$ then prove that $y^2 + 2y - 2 = 0$ 5

8. (a) Prove that $\sqrt{\frac{1-\sin\theta}{1+\sin\theta}} = \sec\theta - \tan\theta$ where θ is not an odd multiple of $\frac{\pi}{2}$ 5

(b) If α, β, γ are the angles of a triangle ABC, then show that :

$\cot\frac{\alpha}{2} + \cot\frac{\beta}{2} + \cot\frac{\gamma}{2} = \cot\frac{\alpha}{2}\cot\frac{\beta}{2}\cot\frac{\gamma}{2}$ 5

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°. 5

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