Roll No LHR-G2-11-18 (To be filled in by the candidate)

MATHEMATICS **(Academic Sessions 2014 – 2016 to 2017 – 2019)**

Q.PAPER – I (Objective Type) 218-(INTER PART – I) GROUP – II

Time Allowed : 30 Minutes
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	$2\sin\left(\frac{P+Q}{2}\right)\cos\left(\frac{P-Q}{2}\right)$ = - - - - - : (A) $\sin P+\sin Q$ (B) $\sin P-\sin Q$ (C) $\cos P+\cos Q$ (D) $\cos P-\cos Q$
2	With usual notation ${}^nC_0$ = : (A) 1 (B) 0 (C) n (D) 2
3	$\sin^{-1}A-\sin^{-1}B$ = ---- : (A) $\sin^{-1}(A\sqrt{1-B^2}-B\sqrt{1-A^2})$ (B) $\sin^{-1}(A\sqrt{1-B^2}+B\sqrt{1-A^2})$ (C) $\cos^{-1}(A\sqrt{1-B^2}-B\sqrt{1-A^2})$ (D) $\cos^{-1}(A\sqrt{1-B^2}+B\sqrt{1-A^2})$
4	Values of trigonometric functions of the quadrantal angle 765° are same as of the angle : (A) 30° (B) [illegible] (C) 60° (D) 90°
5	Solution of $\cot\theta=\frac{1}{\sqrt{3}}$ in quadrant – III (A) $\frac{5\pi}{4}$ (B) $\frac{7\pi}{6}$ (C) $\frac{4\pi}{3}$ (D) π
6	The sum of coefficients in the binomial expansion when n = 4 is : (A) 1 (B) 8 (C) 16 (D) 32
7	With usual notation the " circum-radius" R = ---- : (A) $\frac{\Delta}{s}$ (B) $\frac{abc}{4\Delta}$ (C) $\frac{\Delta}{abc}$ (D) $\frac{s}{\Delta}$
8	Period of $3\sin 2x$ is : (A) 6π (B) 2π (C) π (D) $\frac{\pi}{2}$
9	Which one is divisible by 2 for all positive integral values of n : (A) n^3-n (B) 5^n-1 (C) 5^n-2^n (D) n^2+n
10	In law of tangents $\frac{\tan\left(\frac{\beta-\gamma}{2}\right)}{\tan\left(\frac{\beta+\gamma}{2}\right)}$ = : (A) $\frac{a-b}{a+b}$ (B) $\frac{c-a}{c+a}$ (C) $\frac{c-b}{c+b}$ (D) $\frac{b-c}{b+c}$
11	If 'ω' be the cube root of unity, then ω^2 = : (A) $\frac{-1-\sqrt{3}i}{2}$ (B) $\frac{1-\sqrt{3}i}{2}$ (C) 1 (D) $\frac{1+\sqrt{3}i}{2}$

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1-12	Multiplicative inverse of complex number $-3-5i$ is : (A) $\frac{3}{34}+\frac{5}{34}i$ (B) $\frac{-3}{34}-\frac{5}{34}i$ (C) $\frac{-3}{34}+\frac{5}{34}i$ (D) $\frac{-3}{\sqrt{34}}+\frac{5}{\sqrt{34}}i$
13	Simplify form of $\frac{10!}{7!}$ is equal to : (A) 720 (B) 620 (C) 520 (D) 420
14	If matrix $\begin{bmatrix} x & 4 \\ 2 & 8 \end{bmatrix}$ is singular then $x=$: (A) 0 (B) -1 (C) 2 (D) 1
15	Geometric mean between 4 and 16 are : (A) 10 (B) ± 8 (C) $\frac{32}{5}$ (D) 64
16	Roots of the equation $x^2-7x+10=0$ are : (A) $(2,-5)$ (B) $(-2,5)$ (C) $(2,5)$ (D) $(-2,-5)$
17	Formula for the sum of n terms of A.P. (Arithmetic progression) : (A) $a_n=a_1+(n-1)$ (B) $s_n=\frac{n}{2}(a_1+a_n)$ (C) $s_n=\frac{a_1(1-r^n)}{1-r}$ (D) $s=\frac{a}{}$
18	Tabular form of $\{x \mid x \in E, 4 < x$: (A) $\{\}$ (B) $\{4\}$ (C) $\{6\}$ (D) $\{4,6\}$
19	Partial fractions of $\frac{1}{(x^2+1)(x-1)}$ are of the form : (A) $\frac{A}{x^2+1}+\frac{B}{x-1}$ (B) $\frac{A}{x+1}+\frac{B}{(x^2+1)}+\frac{C}{x-1}$ (C) $\frac{A}{x^2+1}+\frac{Bx+C}{x-1}$ (D) $\frac{Ax+B}{x^2+1}+\frac{C}{x-1}$
20	A matrix A is said to be symmetric if : (A) $A^t=-A$ (B) $A^t=A$ (C) $(\bar{A})^t=A$ (D) $(\bar{A})^t=-A$

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MATHEMATICS 218-(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) Does the set $\{1, -1\}$ close w.r.t. : (a) addition (b) multiplication

(ii) Find multiplicative inverse of the complex number $(-4, 7)$

(iii) If $z = 1 - i\sqrt{3}$, then find $|z|$

(iv) Write inverse and contrapositive of $q \rightarrow p$

(v) If $A = \{a, b, c\}$, then write all subsets of A and find P (A)

(vi) Show that set of natural number is not a group w.r.t. addition.

(vii) Define diagonal matrix with an example.

(viii) If $A = \begin{bmatrix} 2 & 1 \\ 6 & 3 \end{bmatrix}$, then find A^{-1}

(ix) Without expansion show that $\begin{vmatrix} 6 & 7 & 8 \\ 3 & 4 & 5 \\ 2 & 3 & 4 \end{vmatrix} = 0$

(x) Find four 4^{th} roots of unity.

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

(xii) Find quadratic equation whose roots are $2\omega, 2\omega^2$, where ω is cube roots of unity.

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

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

(ii) Find the indicated term of the sequence 2, 6, 11, 17, ----- $a_7 = ?$

(iii) Sum the series upto n-terms $\frac{1}{1-\sqrt{x}} + \frac{1}{1-x} + \frac{1}{1+\sqrt{x}} + \text{-----}$

(iv) Insert two G.Ms between 1 and 8.

(v) Find the sum of the infinite geometric series $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \text{----}$

(vi) Find the 12^{th} term of the harmonic sequence $\frac{1}{3}, \frac{2}{9}, \frac{1}{6}, \text{-----}$

(vii) Evaluate $\frac{15!}{15!(15-15)!}$

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

(ix) There are 5 green and 3 red balls in a box, one ball is taken out, find the probability that the ball drawn is green.

(x) Find the number of the diagonals of a 6-sided figure.

(xi) Find the term involving x^4 in the expansion of $(3-2x)^7$.

(xii) Using binomial theorem find the value of $(1.03)^{\frac{1}{3}}$ upto three decimal places.

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

(i) Define angle in the standard position with figure.

(ii) Find x, if $\tan^2 45° - \cos^2 60° = x \sin 45° \cos 45° \tan 60°$

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

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4. (iv) Find the value of $\sin 540°$ without using calculator.

(v) Prove that $\tan\left(\frac{\pi}{4}-\theta\right)+\tan\left(\frac{3\pi}{4}+\theta\right)=0$

(vi) Express $\sin(x+45°)\sin(x-45°)$ as sum or difference.

(vii) Find the period of $\cos\frac{x}{6}$

(viii) Find the area of triangle ΔABC, in which $b = 37$, $c = 45$ and $\alpha = 30°50'$

(ix) Prove that $r\,r_1\,r_2\,r_3 = \Delta^2$ (Using usual notation)

(x) Prove that $(r_1 + r_2)\tan\frac{\gamma}{2} = c$ (Using usual notation)

(xi) Find domain and range of $y = \cos^{-1} x$

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

(xiii) Find solutions of $\cot\theta = \frac{1}{\sqrt{3}}$ which lie in $[0, 2\pi]$

SECTION – II

Note : Attempt any THREE questions.

5. (a) Convert the following theorem to logical form and prove it by constructing truth table : 5

$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

(b) Solve the following system by reducing their augmented matrices to the echelon form : 5

$$x + 2y + z = 2$$
$$2x + y + 2z = -1$$
$$2x + 3y - z = 9$$

6. (a) If α, β are the roots of the equation $ax^2 + bx + c = 0$ then find the equation whose roots are $\frac{-1}{\alpha^3}, \frac{1}{\beta^3}$ 5

(b) Resolve $\frac{2x^4}{(x-3)(x+2)^2}$ into partial fraction. 5

7. (a) For what value of n, $\frac{a^n + b^n}{a^{n-1} + b^{n-1}}$ is the positive geometric mean (G.M.) between a and b 5

(b) If x is so small that its square and higher powers can be neglected, then show that : 5

$$\frac{(1-x)^{\frac{1}{2}}(9-4x)^{\frac{1}{2}}}{(8+3x)^{\frac{1}{3}}} \approx \frac{3}{2} - \frac{61}{48}x.$$

8. (a) If $\operatorname{cosec}\theta = \frac{m^2+1}{2m}$ and $m > 0$, $\left(0 < \theta < \frac{\pi}{2}\right)$, find the values of the remaining trigonometric ratios. 5

(b) Prove without using calculator that $\cos 20° \cos 40° \cos 60° \cos 80° = \frac{1}{16}$ 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 $2\tan^{-1}\frac{1}{3} + \tan^{-1}\frac{1}{7} = \frac{\pi}{4}$ 5