Roll No LHR-G1-11-18 ( To be filled in by the candidate)

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

Q.PAPER – I ( Objective Type ) 218-(INTER PART – I) Time Allowed : 30 Minutes

GROUP – I Maximum Marks : 20

**PAPER CODE = 6191**

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 set { 0 , 1 } is closed under : | | | |
| | (A) Addition | (B) Multiplication | (C) Division | (D) Subtraction |
| 2 | If A and B are two sets, then A – B = : | | | |
| | (A) $A \cup B^c$ | (B) $(A \cup B)^c$ | (C) $A \cap B^c$ | (D) $(A \cap B)^c$ |
| 3 | A square matrix A is skew symmetric if $A^t$ = : | | | |
| | (A) –A | (B) A | (C) $\overline{A}$ | (D) $A^t$ |
| 4 | If order of a matrix A is m × n, then order of $A^t$ is : | | | |
| | (A) m × n | (B) m × m | (C) n × m | (D) n × n |
| 5 | Sum of roots of quadratic equation $ax^2 + bx + c = 0$ is : | | | |
| | (A) $\frac{a}{b}$ | (B) $\frac{b}{a}$ | (C) $\frac{c}{a}$ | (D) $-\frac{b}{a}$ |
| 6 | Product of all fourth roots of unity is : | | | |
| | (A) – 1 | (B) 0 | (C) 1 | (D) i |
| 7 | The fraction $\frac{3x^2+5}{x+1}$ is : | | | |
| | (A) Proper fraction | (B) Polynomial | | |
| | (C) Partial fraction | (D) Improper fraction | | |
| 8 | Geometric mean between – 2 and 8 is : | | | |
| | (A) 4 | (B) ± 4 | (C) 8 | (D) ± 4i |
| 9 | The 10th term of $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, ----$ is : | | | |
| | (A) 30 | (B) 28 | (C) $\frac{1}{29}$ | (D) $\frac{1}{32}$ |
| 10 | The value of $\frac{4!}{0!}$ is : | | | |
| | (A) 24 | (B) 4 | (C) 0 | (D) Infinity |
| 11 | If A and B are mutually exclusive events, then $P(A \cup B)$ = : | | | |
| | (A) P (A) ∪ P (B) | (B) P (A) + P (B) | | |
| | (C) P ( A ∩ B ) | (D) P (A) – P (B) | | |

LHR-Gi-11-18 (2)

| | |
|---|---|
| 1-12 | $4^n > 3^n + 4$ is true for integral values of n = : <br> (A) 1 (B) $n \leq 1$ (C) 0 (D) $n \geq 2$ |
| 13 | The $2^{nd}$ term in expansion of $\left(1-\frac{1}{3}x\right)^{-1}$ is : <br> (A) $\frac{1}{3}x$ (B) $-\frac{1}{3}x$ (C) $3x$ (D) $2x$ |
| 14 | If $\sin\theta < 0$ and $\cot\theta > 0$, then $\theta$ lies in quadrant : <br> (A) 1 (B) 2 (C) 3 (D) 4 |
| 15 | If $\alpha, \beta, \gamma$ are angles of triangle then $\tan(\alpha+\beta)+\tan\gamma$ = : <br> (A) 1 (B) 0 (C) 2 (D) $-1$ |
| 16 | Period of $\cos\left(\frac{x}{2}\right)$ = : <br> (A) $2\pi$ (B) $\frac{\pi}{2}$ (C) $3\pi$ (D) $4\pi$ |
| 17 | Radius of escribed circle opposite to vertex 'c' of the triangle is : <br> (A) $\frac{\Delta}{s}$ (B) $\frac{\Delta}{s-a}$ (C) $\frac{\Delta}{s-c}$ (D) $\frac{\Delta}{s-b}$ |
| 18 | The value escribed circle $r_1$ = : <br> (A) $\frac{\Delta}{s-a}$ (B) $\frac{\Delta}{s-c}$ (C) $\frac{\Delta}{s}$ (D) $\frac{\Delta}{a}$ |
| 19 | The value of $\cos\left(\tan^{-1} 0\right)$ = : <br> (A) $-1$ (B) 1 (C) 0 (D) $\infty$ |
| 20 | If $\cos x = -\frac{1}{2}$, then reference angle is : <br> (A) $\frac{\pi}{6}$ (B) $-\frac{\pi}{3}$ (C) $\frac{\pi}{3}$ (D) $\frac{\pi}{2}$ |

Roll No LHR-G1-11-18 ( To be filled in by the candidate)

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

MATHEMATICS 218-(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) Simplify $(-1)^{-21}$

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

(iii) Find the multiplicative inverse of $(-4, 7)$

(iv) Is there any set which has no proper subset? If so name that set.

(v) Write the converse and contrapositive of $\sim q \rightarrow \sim p$

(vi) For A = { 1 , 2 , 3 , 4 }, find the relation in A for $R = \{(x, y) | x + y < 5\}$, also write the range of R.

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

(viii) Find the multiplicative inverse of the matrix $\begin{bmatrix} 2i & i \\ i & -i \end{bmatrix}$

(ix) Show that $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ yz & zx & xy \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix}$

(x) Solve the equation $x^4 - 6x^2 + 8 = 0$

(xi) Show that $x^3 - y^3 = (x-y)(x-\omega y)(x-\omega^2 y)$, $\omega$ is complex cube root of unity.

(xii) If $\alpha$ , $\beta$ are the roots of $3x^2 - 2x + 4 = 0$ , then find the value of $\frac{1}{\alpha^3} + \frac{1}{\beta^3}$

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

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

(ii) If $a_{n-2} = 3n - 11$ , find the nth term of the sequence

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

(iv) Which term of the A.P. 5, 2 , – 1, ------- is – 85 ?

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

(vi) If 5 is the harmonic mean between 2 and b, find b

(vii) Define fundamental principle of counting.

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

(ix) What is probability that a slip of numbers divisible by 4 are picked from the slips bearing number 1, 2, 3, ----- 10?

(x) State the principle of mathematical induction.

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

(xii) Find the 6th term in the expansion of $\left(x^2 - \frac{3}{2x}\right)^{10}$

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

(i) An arc subtends an angle of $70^{\circ}$ at the center of a circle and its length is 132 m. Find the radius of the circle.

(ii) Define coterminal angles.

(iii) Verify $\sin^2\frac{\pi}{6}+\sin^2\frac{\pi}{3}+\tan^2\frac{\pi}{4}=2$

(iv) If $\alpha,\beta,\gamma$ are angles of a triangle $\Delta ABC$, then prove that $\tan(\alpha+\beta)+\tan\gamma=0$

(v) Find the value of $\sin 105°$, without calculator.

(vi) Prove that $\cot\alpha-\tan\alpha=2\cot 2\alpha$

(vii) Write the domain of $y=\sin x$

(viii) A vertical pole is 8m high and the length of its shadow is 6m. What is the angle of elevation of the sun at that moment?

(ix) Find $\alpha$ and $\beta$ in the triangle $\Delta ABC$ in which $a=7$ , $b=7$ , $c=9$

(x) Find the area of the triangle $\Delta ABC$ in which $a=200$ , $b=120$ , $\gamma=150^{\circ}$

(xi) Evaluate without using calculator $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$

(xii) Solve the equation $2\sin x-1=0$

(xiii) Find the solution of the equation which lie in interval $[0,2\pi]$ : $\sec x=-2$

## SECTION – II

Note : Attempt any THREE questions.

5. (a) Consider the set $S=\{1,-1,i,-i\}$. Set up its multiplication table and show that the set S is an abelian group under multiplication. 5

(b) If $A=\begin{bmatrix}1&0&2\\0&2&1\\1&-1&1\end{bmatrix}$ then find $A^{-1}$ by using adjoint of the matrix. 5

6. (a) Solve the system of equations : $x+y=a+b$ ; *and* $\frac{a}{x}+\frac{b}{y}=2$ 5

(b) Resolve $\frac{9x-7}{(x^2+1)(x+3)}$ into partial fractions. 5

7. (a) Find four numbers in arithmetic sequence ( A.P. ) whose sum is 32 and the sum of whose squares is 276. 5

(b) Use binomial series to show that $1+\frac{1}{4}+\frac{1\times3}{4\times8}+\frac{1\times3\times5}{4\times8\times12}+---=\sqrt{2}$ 5

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 all remaining trigonometric ratios. 5

(b) Prove that $\sin\frac{\pi}{9}\sin\frac{2\pi}{9}\sin\frac{\pi}{3}\sin\frac{4\pi}{9}=\frac{3}{16}$ without using calculator. 5

9. (a) With usual notations, prove that $r_1=\frac{\Delta}{s}$ 5

(b) Prove that $\sin^{-1}\frac{3}{5}+\sin^{-1}\frac{8}{17}=\sin^{-1}\frac{77}{85}$ 5

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 | $2\sin\left(\frac{P+Q}{2}\right)\cos\left(\frac{P-Q}{2}\right)$ = - - - - : <br> (A) $\sin P+\sin Q$ (B) $\sin P-\sin Q$ <br> (C) $\cos P+\cos Q$ (D) $\cos P-\cos Q$ |
| 2 | With usual notation ${}^nC_0$ = : <br> (A) 1 (B) 0 (C) n (D) 2 |
| 3 | $\sin^{-1}A-\sin^{-1}B$ = ---- : <br> (A) $\sin^{-1}(A\sqrt{1-B^2}-B\sqrt{1-A^2})$ (B) $\sin^{-1}(A\sqrt{1-B^2}+B\sqrt{1-A^2})$ <br> (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 $765^\circ$ are same as of the angle : <br> (A) $30^\circ$ (B) (C) $60^\circ$ (D) $90^\circ$ |
| 5 | Solution of $\cot\theta=\frac{1}{\sqrt{3}}$ in quadrant – III <br> (A) $\frac{5\pi}{4}$ (B) $\frac{7\pi}{6}$ (C) $\frac{4\pi}{3}$ (D) $\pi$ |
| 6 | The sum of coefficients in the binomial expansion when n = 4 is : <br> (A) 1 (B) 8 (C) 16 (D) 32 |
| 7 | With usual notation the " circum-radius" R = ---- : <br> (A) $\frac{\Delta}{s}$ (B) $\frac{abc}{4\Delta}$ (C) $\frac{\Delta}{abc}$ (D) $\frac{s}{\Delta}$ |
| 8 | Period of $3\sin 2x$ is : <br> (A) $6\pi$ (B) $2\pi$ (C) $\pi$ (D) $\frac{\pi}{2}$ |
| 9 | Which one is divisible by 2 for all positive integral values of n : <br> (A) $n^3-n$ (B) $5^n-1$ (C) $5^n-2^n$ (D) $n^2+n$ |
| 10 | In law of tangents $\frac{\tan\left(\frac{\beta-\gamma}{2}\right)}{\tan\left(\frac{\beta+\gamma}{2}\right)}$ = : <br> (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 $\omega^2$ = : <br> (A) $\frac{-1-\sqrt{3}i}{2}$ (B) $\frac{1-\sqrt{3}i}{2}$ (C) 1 (D) $\frac{1+\sqrt{3}i}{2}$ |

( Turn Over )

LHR-G2-11-18 (2)

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

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

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

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 $\alpha, \beta$ 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 $\omega$ 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 $\frac{1}{1+\sin\theta} - \frac{1}{1-\sin\theta} = 2\sec^2 0$

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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 $\Delta ABC$, 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 $\alpha, \beta$ 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