Roll No. ________________

MATHEMATICS **(INTER PART-I) 321-(IV)** **PAPER: I** **GROUP: I**

Time: 30 Minutes **OBJECTIVE** **Marks: 20**

Code: 6197 GUJ-G1-21

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1- 1- Period of $\tan 4x$ is

(A) $\pi/2$ (B) π (C) $\pi/4$ (D) 4π

2- Radius of the earth is

(A) 6000 Km (B) 6800 Km (C) 6400 Km (D) 8400 Km

3- If $a = -2$, $b = -6$ then A.M between a and b is =

(A) 12 (B) -8 (C) -4 (D) 4

4- Multiplicative inverse of (a, 0) if $a \neq 0$ is

(A) $\left(\frac{1}{a}, 0\right)$ (B) $\frac{1}{(a, 0)}$ (C) $(-a, 0)$ (D) $\left(0, \frac{1}{a}\right)$

5- Transpose of a matrix $A = [a_{ij}]_{m \times n}$ is $A^t =$

(A) $[a_{ij}]_{m \times m}$ (B) $[a_{ji}]_{m \times n}$ (C) $[a_{ji}]_{n \times m}$ (D) $[a_{ij}]_{n \times m}$

6- If $n \in Z$, then general solution of equation $\sin x = 0$ is

(A) $\left\{n\frac{\pi}{2}\right\}$ (B) $\left\{n\frac{\pi}{3}\right\}$ (C) $\left\{n\frac{\pi}{4}\right\}$ (D) $\{n\pi\}$

7- $(S-a)(S-b)(S-c) =$

(A) $\frac{\Delta}{S}$ (B) $\frac{\Delta^2}{S}$ (C) $\frac{\Delta}{S^2}$ (D) $\frac{S}{\Delta}$

8- $\sin 540^\circ =$

(A) 1 (B) 0 (C) $\frac{1}{2}$ (D) $\frac{1}{\sqrt{2}}$

9- $(n+2)(n+1)(n) =$

(A) $\frac{(n+2)!}{n!}$ (B) $\frac{(n+2)!}{(n-1)!}$ (C) $\frac{(n+2)!}{(n+1)!}$ (D) $\frac{n!}{(n+1)!}$

10- $S_n = \frac{a(r^n - 1)}{r - 1}$ holds if

(A) $r \leq 1$ (B) $r = 1$ (C) $r > 1$ (D) $r \geq 1$

11- If $|A| = 0$ then A is

(A) singular (B) diagonal (C) rectangular (D) symmetric

(Turn over)

GOJ-G1-21

12- $\cos 2\theta =$

(A) $1-\sin^2\theta$ (B) $1-2\sin^2\theta$ (C) $1-2\sin\theta$ (D) $2\sin^2\theta-1$

13- Product of the roots of $5x^2-x-2=0$ is =

(A) $\frac{1}{5}$ (B) $-\frac{1}{5}$ (C) $\frac{2}{5}$ (D) $-\frac{2}{5}$

14- If $S_n = n(2n-1)$, then $a_1 =$

(A) 2 (B) −2 (C) 1 (D) −1

15- The property which makes a group Abelian is

(A) associative (B) commutative (C) identity (D) closure

16- $\tan(\cos^{-1}\frac{\sqrt{3}}{2}) =$

(A) $\sqrt{3}$ (B) $\frac{1}{\sqrt{3}}$ (C) $\frac{1}{\sqrt{2}}$ (D) $\sqrt{2}$

17- To find T_8 in the binomial expansion we put r =

(A) 8 (B) 9 (C) 10 (D) 7

18- The product of 4, 4^{th} roots of unity is =

(A) 1 (B) −1 (C) i (D) −i

19- $\frac{x^3+x+1}{Q(x)}$ will be proper if the degree of $Q(x)$ is =

(A) 1 (B) 2 (C) 3 (D) 4

20- $2R =$

(A) $\frac{a}{\sin\alpha}$ (B) $\frac{b}{\sin\beta}$ (C) $\frac{c}{\sin\gamma}$ (D) all of these

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MATHEMATICS **(INTER PART-I) 321** **PAPER: I** **GROUP: I**

Time: 2:30 hours **SUBJECTIVE** **Marks: 80**

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

(4)

SECTION I GUJ-G1-21

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

i- Prove $\frac{a}{c}+\frac{b}{c}=\frac{a+b}{c}$ by rules of addition.

ii- Factorize: a^2+4b^2

iii- Simplify $(2+\sqrt{-3})(3+\sqrt{-3})$

iv- If $U=\{1,2,3,\ldots\ldots.20\}$ and $A=\{1,3,5,\ldots\ldots,19\}$ verify $A\cup A'=U$

v- Write inverse and contrapositive of the conditional $\sim p \rightarrow q$

vi- For $A=\{1,2,3,4\}$, find the relation $\{(x,y)\,|\,x+y>5\}$ in A

vii- Find x and y if $\begin{bmatrix} x+3 & 1 \\ -3 & 3y-4 \end{bmatrix}=\begin{bmatrix} y & 1 \\ -3 & 2x \end{bmatrix}$

viii- Without expansion show that $\begin{vmatrix} 2 & 3 & -1 \\ 1 & 1 & 0 \\ 2 & -3 & 5 \end{vmatrix}=0$

ix- Find the inverse of matrix $A=\begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$

x- Write second property of cube roots of unity without proof.

xi- Find the remainder by using remainder theorem when first polynomial is divided by second polynomial $x^2+3x+7,\ x+1$

xii- Show that the roots of the equation $(p+q)x^2-px-q=0$ will be rational.

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Write $\frac{x^2+x-1}{(x+2)^3}$ in form of partial fractions without finding the constants.

ii- Write $\frac{1}{(x+1)^2(x^2-1)}$ in form of partial fractions without finding the constants.

iii- Write Ist four terms of the sequence $a_n=(-1)^n(2n-3)$

iv- Find G.M. between -2 and 8

v- Find the sum of infinite geometric series $2, \sqrt{2}, 1, \ldots\ldots\ldots$

vi- Find the 9^{th} term of harmonic sequence $\frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \ldots\ldots\ldots$

vii- There are 5 green and 3 red balls in a box, one ball is taken out. Find the probability that the ball is green.

viii- Write in factorial form $(n+2)(n+1)n$

ix- How many signals can be given by 5 flags of different colours using 3 flags at a time.

x- Calculate $(0.97)^3$ by means of binomial theorem.

xi- Expand $(4-3x)^{1/2}$ upto three terms taking value of x such that (s.t) the expansion is valid.

xii- Determine the middle term in the expansion of $\left(\frac{1}{x}-\frac{x^2}{2}\right)^{12}$

(Turn over)

(5)

4. Write short answers to any NINE questions: (2 x 9 = 18)

i- If $\sin\theta = -\frac{1}{\sqrt{2}}$ and the terminal arm is not in quadrant III, find the value of $\cos\theta$

ii- Verify that $\sin^2\frac{\pi}{6} : \sin^2\frac{\pi}{4} : \sin^2\frac{\pi}{3} : \sin^2\frac{\pi}{2} = 1:2:3:4$

iii- Prove that $\sec^2 A + \operatorname{cosec}^2 A = \sec^2 A \cdot \operatorname{cosec}^2 A$, where $A \neq \frac{n\pi}{2}$, $n \in Z$

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

v- Prove that $\cos(\alpha + 45^\circ) = \frac{1}{\sqrt{2}}(\cos\alpha - \sin\alpha)$

vi- Prove that $\frac{\sin A + \sin 2A}{1 + \cos A + \cos 2A} = \tan A$

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

viii- When the angle between the ground and the sun is 30°, flag pole casts a shadow of 40 m long. Find the height of the top of the flag.

ix- Find the measure of the greatest angle, if sides of the triangle are 16, 20, 33

x- Find the area of the triangle when $b = 25.4$, $\gamma = 36^\circ 41'$, $\alpha = 45^\circ 17'$

xi- Prove that $\tan^{-1}\frac{5}{12} = \sin^{-1}\frac{5}{13}$

xii- Find the general solution of the trigonometric equation $\sec x = -2$

xiii- Solve the trigonometric equation and write the solution in the interval $[0, 2\pi]$ when $2\sin^2\theta - \sin\theta = 0$

SECTION II

5- (a) Show that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$ 5

(b) Show that the roots of $x^2 + (mx+c)^2 = a^2$ will be equal, if $c^2 = a^2(1+m^2)$ 5

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

(b) If $y = \frac{x}{2} + \frac{1}{4}x^2 + \frac{1}{8}x^3 + \ldots\ldots$ and $0 < x < 2$, then prove that $x = \frac{2y}{1+y}$ 5

7- (a) Two dice are thrown. What is the probability that the sum of the number of dots appearing on them is 4 or 6 ? 5

(b) If x is so small that its square and higher powers can be neglected then show that $\frac{\sqrt{1+2x}}{\sqrt{1-x}} \approx 1 + \frac{3x}{2}$ 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) Prove without using tables/calculator that $\sin 19^\circ \cos 11^\circ + \sin 71^\circ \sin 11^\circ = \frac{1}{2}$ 5

9- (a) P and Q are two points in line with a tree. If the distance between P and Q be 30 m and the angles of elevation of the top of the tree at P and Q be 12° and 15° respectively, find the height of the tree. 5

(b) Show that $2\tan^{-1}\frac{2}{3} = \sin^{-1}\frac{12}{13}$ 5

Roll No. ________________

MATHEMATICS **(INTER PART-I) 321-(I)** **PAPER: I** **GROUP: II**

Time: 30 Minutes **OBJECTIVE** **Marks: 20**

Code: 6192 GUJ-G2-21

Note: You have four choices for each objective type question as A, B, C and D. The choice which you think is correct, fill that circle in front of that question number. Use marker or pen to fill the circles. Cutting or filling two or more circles will result in zero mark in that question. Attempt as many questions as given in objective type question paper and leave others blank.

1- 1- The property used in $\forall\ a, b \in R \quad a = b \wedge b = c \Rightarrow a = c$

(A) reflexive (B) symmetric (C) transitive (D) trichotomy

2- The converse of $p \rightarrow q$ is

(A) $\sim p \rightarrow \sim q$ (B) $\sim q \rightarrow \sim p$ (C) $q \rightarrow p$ (D) $\sim p \rightarrow q$

3- If A is a square matrix of order 3 then $|kA| =$

(A) $k|A|$ (B) $k^2|A|$ (C) $k^3|A|$ (D) $k|A^3|$

4- A square matrix is skew symmetric matrix, if $A^t =$

(A) A (B) $\overline{A}$ (C) A^t (D) $-A$

5- If ω is complex cube roots of unity, then conjugate of ω is

(A) ω^2 (B) $-\omega^2$ (C) $-\omega$ (D) $-i$

6- The product of roots of equation $4x^2 + 7x - 3 = 0$ is

(A) $\frac{7}{4}$ (B) $-\frac{7}{4}$ (C) $\frac{3}{4}$ (D) $-\frac{3}{4}$

7- In $\frac{P(x)}{Q(x)}$, if degree of $P(x) \geq$ degree of $Q(x)$ then fraction is

(A) proper (B) improper (C) irrational (D) identity

8- Next term of sequence 1, 3, 7, 15, 31, ... is

(A) 39 (B) 47 (C) 55 (D) 63

9- Sum of infinite geometric series is valid, if

(A) $r < 1$ (B) $|r| < 1$ (C) $|r| = 1$ (D) $|r| > 1$

10- The sequence $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, ...$ is

(A) H . P (B) A . P (C) G. P (D) arithmetic series

11- $(n-1)(n-2)(n-3)\ ....\ (n-r+1) =$

(A) $\frac{(n-1)!}{(n-r)!}$ (B) $\frac{n!}{(n-r)!}$ (C) $\frac{(n-1)!}{(n-r+2)!}$ (D) $\frac{n!}{(n-r+1)!}$

(Turn over)

12- The number of terms in the expansion of $(1+x)^{1/2}$ are

(A) $\frac{3}{2}$ (B) 7 (C) 6 (D) infinite

13- If $\tan\theta = \frac{8}{15}$, $\pi < \theta < 3\frac{\pi}{2}$, then $\cos\theta =$

(A) $\frac{-17}{15}$ (B) $\frac{17}{15}$ (C) $\frac{15}{17}$ (D) $\frac{-15}{17}$

14- Which of the following is not quadrantal angle

(A) $\frac{\pi}{2}$ (B) $4\frac{\pi}{3}$ (C) $9\frac{\pi}{2}$ (D) 13π

15- $\cot\left(3\frac{\pi}{2} - \theta\right) =$

(A) $\tan\theta$ (B) $-\tan\theta$ (C) $\cot\theta$ (D) $-\cot\theta$

16- Range of $y = \cos x$ is

(A) $-1 \le x \le 1$ (B) $-\infty < x < \infty$ (C) $-1 \le y \le 1$ (D) $-\infty < y < \infty$

17- Area of triangle ABC is

(A) $\frac{1}{2}ab\sin\beta$ (B) $\frac{1}{2}bc\sin\alpha$ (C) $\frac{1}{2}ac\sin\gamma$ (D) $\frac{1}{2}ab\sin\alpha$

18- With usual notation $2s - b =$

(A) $a - c$ (B) $a + c$ (C) $a + 2b + c$ (D) $2a + b + 2c$

19- $\cos^{-1}(-x) =$

(A) $-\cos^{-1}x$ (B) $\cos^{-1}x$ (C) $\pi - \cos^{-1}x$ (D) $\frac{\pi}{2} - \cos^{-1}x$

20- If $n \in Z$, then general solution of equation $\sin x = 0$ is

(A) $\left\{n\frac{\pi}{2}\right\}$ (B) $\left\{n\frac{\pi}{3}\right\}$ (C) $\left\{n\frac{\pi}{4}\right\}$ (D) $\{n\pi\}$

G (4)

MATHEMATICS (INTER PART-I) 321 **PAPER: I** **GROUP: II**

Time: 2:30 hours **SUBJECTIVE** **Marks: 80**

Note: Section I is compulsory. Attempt any three (3) questions from Section II.

SECTION I GUJ-G2-21

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

i- Does the set $\{1,-1\}$ possess closure property with respect to addition and multiplication?

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

iii- Show that $\forall\ Z \in C\quad Z^2+Z^{-2}$ is a real number.

iv- Write the descriptive and tabular form of $\{x \mid x \in Q \wedge x^2 = 2\}$

v- Write the converse and inverse of $\sim p \rightarrow q$

vi- Solve the equation $ax = b$, where a, b are the elements of a group G.

vii- If A and B are square matrices of the same order, explain why in general $(A+B)(A-B) \neq A^2-B^2$

viii- Without expansion show that $\begin{vmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{vmatrix} = 0$

ix- Find the inverse of the matrix $\begin{bmatrix} -2 & 3 \\ -4 & 5 \end{bmatrix}$

x- Solve the equation by factorization method $9x^2-12x-5=0$

xi- Evaluate: $(1+\omega-\omega^2)(1-\omega+\omega^2)$

xii- Discuss the nature of the roots of the equation: $2x^2+5x-1=0$

3. Write short answers to any EIGHT questions: **(2 x 8 = 16)**

i- Resolve into partial fractions, without finding the constants $\dfrac{x-1}{(x-2)(x+1)^3}$

ii- Write $\dfrac{1}{(x+1)^2(x^2-1)}$ in form of partial fractions without finding the constants.

iii- Which term of the arithmetic sequence OR arithmetic progression $5, 2, -1, \ldots\ldots\ldots$ is -85 ?

iv- Find the vulgar fraction equivalent to the recurring decimals $0.\overline{7}$

v- Find 9^{th} term of the harmonic sequence $\frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \ldots\ldots\ldots$

vi- If A, G, H are the arithmetic, geometric and harmonic means between a & b respectively, Show that $G^2 = A.H$

vii- In how many ways can 4 keys be arranged on a circular key ring?

viii- Prove that ${}^nC_r = {}^nC_{n-r}$

ix- Find the value of n when, ${}^nC_{10} = \dfrac{12 \times 11}{2!}$

x- Expand by using the binomial theorem $(a+2b)^5$

xi- Expand $(1+x)^{-1/3}$ up to 3 terms by using binomial expansion.

xii- If x is so small that its square and higher powers can be neglected then show that $\dfrac{1-x}{\sqrt{1+x}} \approx 1-\dfrac{3}{2}x$

(Turn over)

5

(2) GUJ-G2-21

4. **Write short answers to any NINE questions:** (2 x 9 = 18)

i- If $\operatorname{cosec}\theta = \frac{m^2+1}{2m}$ $0 < \theta < \frac{\pi}{2}$. Find the value of $\sec\theta$

ii- Evaluate: $\frac{1-\tan^2\frac{\pi}{3}}{1+\tan^2\frac{\pi}{3}}$

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

iv- Without using calculator find the value of $\tan(1110^\circ)$

v- Prove that $\sin\left(\theta+\frac{\pi}{6}\right) + \cos\left(\theta+\frac{\pi}{3}\right) = \cos\theta$

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

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

viii- Prove that $R = \frac{abc}{4\Delta}$ using $R = \frac{a}{2\sin\alpha}$

ix- Find the measure of the greatest angle, if sides of the triangle are 16, 20, 33

x- Prove that $abc(\sin\alpha + \sin\beta + \sin\gamma) = 4\Delta s$

xi- Find the value of $\sec[\sin^{-1}(-\frac{1}{2})]$

xii- Find the general solution of the trigonometric equation $\sec x = -2$

xiii- Solve the trigonometric equation and write the solution in the interval $[0, 2\pi]$ when $2\sin^2\theta - \sin\theta = 0$

SECTION II

5- (a) Show that $\begin{vmatrix} b+c & a & a^2 \\ c+a & b & b^2 \\ a+b & c & c^2 \end{vmatrix} = (a+b+c)(a-b)(b-c)(c-a)$ 5

(b) Prove that $\frac{x^2}{a^2} + \frac{(mx+c)^2}{b^2} = 1$ will have equal roots if $c^2 = a^2m^2 + b^2$ 5

Where $a \neq 0$, $b \neq 0$

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

(b) The sum of three numbers in an A.P is 24 and their product is 440. Find the numbers. 5

7- (a) Find the values of n and r when ${}^nC_r = 35$ and ${}^nP_r = 210$ 5

(b) If $y = \frac{2}{5} + \frac{1.3}{2!}\left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!}\left(\frac{2}{5}\right)^3 + \ldots\ldots$, then prove that $y^2 + 2y - 4 = 0$ 5

8- (a) Prove the identity $\sin^6\theta - \cos^6\theta = (\sin^2\theta - \cos^2\theta)(1 - \sin^2\theta\cos^2\theta)$ 5

(b) Prove that $\frac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \tan 37^\circ$ 5

9- (a) Solve the triangle ABC if $b = 61$; $a = 32$ and $\alpha = 59^\circ 30'$ using first law of tangents and then law of sines 5

(b) Prove that $\tan^{-1}\left(\frac{1}{11}\right) + \tan^{-1}\left(\frac{5}{6}\right) = \tan^{-1}\left(\frac{1}{3}\right) + \tan^{-1}\left(\frac{1}{2}\right)$ 5