Roll No. ____________

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MATHEMATICS | **Intermediate Part-I, Class 11th (1st A 323-I)** | **PAPER: I** | **GROUP - I**

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

Code: 6191

Guj-11-1-23

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.

1- The multiplicative inverse of complex number (0 , 1) is
(A) (0 , –1) (B) (–1 , 0) (C) (1 , 0) (D) (1 , 1)

2- Converse of $p \rightarrow q$ is
(A) $\sim p \rightarrow q$ (B) $p \rightarrow \sim q$ (C) $q \rightarrow p$ (D) $\sim q \rightarrow p$

3- $(A^{-1})^t =$
(A) A (B) $-A^t$ (C) $A^{-1}A^t$ (D) $(A^t)^{-1}$

4- The trivial solution of the system $a_1x + b_1y = 0$ and $a_2x + b_2y = 0$ is
(A) (1 , 0) (B) (0 , 1) (C) (0 , 0) (D) (1 , 1)

5- Sum of all four fourth roots of unity is
(A) 1 (B) –1 (C) 0 (D) i

6- Roots of the equation $ax^2 + bx + c = 0$ are real and distinct if
(A) $b^2 - 4ac = 0$ (B) $b^2 - 4ac > 0$ (C) $b^2 - 4ac < 0$ (D) $a^2 - 4ac > 0$

7- A relation in which the equality is true for any value of unknowns is called
(A) identity (B) equation (C) fraction (D) conditional

8- The sequence 3, 6, 12, ….. is
(A) A.P. (B) G.P. (C) H.P. (D) infinite

9- Harmonic mean between 3 and 7 is
(A) $\frac{5}{21}$ (B) $\frac{21}{5}$ (C) 5 (D) 21

10- Factorial form of $n(n-1)(n-2) =$ ________
(A) $\frac{n!}{(n-1)!}$ (B) $\frac{n!}{(n-2)!}$ (C) $\frac{n!}{(n-3)!}$ (D) $\frac{n!}{(n+3)!}$

11- If A and B are independent events and P(A) = 0.8 , P(B) = 0.7 then $P(A \cap B) =$
(A) 0.56 (B) $\frac{8}{7}$ (C) $\frac{7}{8}$ (D) 0.1

12- The sum of exponents of a and b in every term of the expansion of $(a+b)^n$ is
(A) 1 (B) 0 (C) 2n (D) n

13- The expansion of $(1+2x)^{-3}$ is valid only if
(A) $|x| < 2$ (B) $|x| < \frac{1}{2}$ (C) $|x| < \frac{1}{3}$ (D) $|x| < \frac{1}{6}$

14- If length of arc and radius of circle are measured in cm then unit of Q is
(A) degree (B) radians (C) cm^2 (D) cm

15- $\text{Cos } 2\alpha =$
(A) $2\text{Cos}^2\alpha + 1$ (B) $2\text{Cos}^2\alpha - 1$ (C) $2\text{Sin}^2\alpha - 1$ (D) $2\text{Sin}^2\alpha + 1$

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16- The smallest positive number P for which $f(x+P) = f(x)$ is called
(A) domain (B) co-domain (C) range (D) period

17- In any triangle ABC, $c^2 =$ ________
(A) $a^2 + c^2 - 2ac\,\text{Cos}\beta$ (B) $a^2 + b^2 - 2ab\,\text{Cos}\gamma$
(C) $b^2 + c^2 - 2bc\,\text{Cos}\alpha$ (D) $a^2 + b^2 - 2ab\,\text{Cos}\alpha$

18- Point of intersection of the angle bisectors of a triangle is called
(A) circum–centre (B) in–centre (C) ex–centre (D) ortho–centre

19- $2\text{Tan}^{-1}A =$
(A) $\text{Tan}^{-1}\frac{A}{1-A^2}$ (B) $\text{Tan}^{-1}\frac{2A}{1+A^2}$ (C) $\text{Tan}^{-1}\left(\frac{2A}{1-A^2}\right)$ (D) $\text{Tan}^{-1}\left(\frac{2A}{2-A^2}\right)$

20- If $\text{Sin}x + \text{Cos}x = 0$ then x = ________
(A) $\frac{\pi}{4}, -\frac{\pi}{4}$ (B) $-\frac{\pi}{4}, -\frac{\pi}{2}$ (C) $-\frac{\pi}{4}, \frac{3\pi}{4}$ (D) $\frac{\pi}{4}, \frac{3\pi}{4}$

Goj-11-1-23

.ATHEMATICS	Intermediate Part-I, Class 11th (1stA 323) (4)	PAPER: I	GROUP - I
Time: 2:30 hours	SUBJECTIVE		Marks: 80

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

SECTION-I

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

i- Check the closure property with respect to multiplication on the set $\{-1, 1\}$

ii- Simplify the complex numbers $(5, -4)(-3, -2)$

iii- Write down the descriptive and tabular form of $\{x \mid x \in P \wedge x < 12\}$

iv- Verify commutative property of union and intersection for sets $A = \{1,2,3,4,5\}$, $B = \{4,6,8,10\}$

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

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

vii- If A and B are non–singular matrices. Then show that $(AB)^{-1} = B^{-1}A^{-1}$

viii- Without expansion show that $\begin{vmatrix} \alpha & \beta+\gamma & 1 \\ \beta & \gamma+\alpha & 1 \\ \gamma & \alpha+\beta & 1 \end{vmatrix} = 0$

ix- Solve the equation $x^2 - 7x + 10 = 0$ by factorization.

x- Reduce $2x^4 - 3x^3 - x^2 - 3x + 2 = 0$ into quadratic form.

xi- Solve the equation $x^{1/2} - x^{1/4} - 6 = 0$

xii- Define reciprocal equation.

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

i- Resolve into partial fractions of $\frac{x^2+1}{(x-1)(x+1)}$ without finding values of constants.

ii- Write down next two terms of sequence $-1, 2, 12, 40, \ldots\ldots\ldots$

iii- Insert two G.Ms. between 1 and 8

iv- Find n^{th} term of $\frac{1}{2}, \frac{1}{5}, \frac{1}{8}, \ldots\ldots\ldots$

v- Prove that $\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$

vi- If 5, 8 are two A.Ms. between a and b. Find a and b.

vii- Find the value of n^{-1} when ${}^{n}P_4 : {}^{n-1}P_3 = 9:1$

viii- How many arrangements of letters of word PAKPATTAN, taken all together, can be made ?

ix- Two dice are thrown twice. What is probability that sum of dots shown in first throw is 7 and that of second throw is 11 ?

x- Show that in–equality $4^n > 3^n + 4$ holds for $n = 2$, $n = 3$

xi- Using binomial theorem, expand $(a + 2b)^5$

xii- Expand up to 4 terms, taking the value of x such that expansion is valid: $(8 - 2x)^{-1}$

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

i- What is the length of the arc intercepted on a circle of radius 14cm by the arms of central angle of 45° ?

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 $\frac{\sin\theta}{1+\cos\theta} + \cot\theta = \operatorname{Cosec}\theta$

iv- Without using table, find the value of $\tan(-135^\circ)$

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(5)

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

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

vii- Find the period of $\cot 8x$

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

ix- Find the smallest angle of the triangle ABC when $a=37.34$, $b=3.24$, $c=35.06$

x- Find the area of the triangle ABC when $a=200$, $b=120$, $\gamma=150^\circ$

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

xii- Find the solution set of $\sin x.\cos x=\frac{\sqrt{3}}{4}$

xiii- Find the solution of $\sin x=\frac{1}{2}$ in $[0, 2\pi]$

SECTION-II

Note: Attempt any three (3) questions.

5- (a) Use matrices to solve the system of equations 5

$$2x_1+x_2+3x_3=3$$
$$x_1+x_2-2x_3=0$$
$$-3x_1-x_2+2x_3=-4$$

(b) Solve the equation $\left(x-\frac{1}{x}\right)^2+3\left(x+\frac{1}{x}\right)=0$ 5

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

(b) A die is thrown. Find the probability that the dots on the top are prime numbers or odd numbers. 5

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

(b) If $y=\frac{2}{5}+\frac{1\cdot3}{2!}\left(\frac{2}{5}\right)^2+\frac{1\cdot3\cdot5}{3!}\left(\frac{2}{5}\right)^3+\dots\dots\dots$ then prove that $y^2+2y-4=0$ 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 $\alpha+\beta+\gamma=180^\circ$, show that $\cot\alpha\cot\beta+\cot\beta\cot\gamma+\cot\gamma\cot\alpha=1$ 5

9- (a) Using law of tangents, solve the ΔABC in which $a=36.21$, $b=42.09$ and $\gamma=44^\circ 29'$ 5

(b) Prove that $2\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{1}{7}\right)=\frac{\pi}{4}$ 5

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MATHEMATICS Intermediate Part-I, Class 11th (1st A 323- I) **PAPER: I** **GROUP: II**

Time: 30 Minutes Guj-11-2-23 **OBJECTIVE** **Marks: 20**

Code: 6192

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.

1- 1- Every real number is a complex number with its imaginary part equal to
(A) real part (B) i (C) 0 (D) 1

2- If A and B are disjoint sets, then $A - B =$
(A) $B - A$ (B) A (C) B (D) ϕ

3- If order of a matrix A is 2×3 and that of matrix B is 3×2, then order of $(AB)^t$ is
(A) 3×3 (B) 2×2 (C) 3×2 (D) 2×3

4- A square matrix $A = [a_{ij}]$ is lower triangular if
(A) $a_{ij} \neq 0$ for all $i < j$ (B) $a_{ij} \neq 0$ for all $i > j$
(C) $a_{ij} = 0$ for all $i > j$ (D) $a_{ij} = 0$ for all $i < j$

5- Four 4th roots of 625 are
(A) $\pm 25i, \pm 25$ (B) $\pm 16i, \pm 16$ (C) $\pm 5i, \pm 5$ (D) $\pm 4i, \pm 4$

6- If α, β are roots of the equation $3x^2 - 2x + 4 = 0$, then value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ is
(A) $\frac{3}{4}$ (B) $-\frac{4}{3}$ (C) $\frac{5}{3}$ (D) $-\frac{5}{3}$

7- Partial fractions of $\frac{1}{x^2+1}$ are
(A) $\frac{A}{x+1} - \frac{B}{x-1}$ (B) $\frac{A}{x+1} + \frac{B}{x-1}$ (C) $\frac{Ax+B}{x^2+1}$ (D) not possible

8- 5th term of the sequence whose general term is $a_n = n + (-1)^n$, is
(A) 4 (B) 5 (C) 0 (D) -5

9- Which one is true
(A) G, H, A are in G.P. (B) A, G, H are in G.P.
(C) A,G,H are in H.P. (D) A,G,H are in A.P.

10- The complementary combination ${}^nC_r = {}^nC_{n-r}$ is useful when
(A) $n = r$ (B) $n < r$ (C) $r < \frac{n}{2}$ (D) $r > \frac{n}{2}$

11- Two dice are thrown simultaneously, then the probability of getting a total of "7" number of dots is
(A) $\frac{1}{6}$ (B) $\frac{1}{18}$ (C) $\frac{4}{9}$ (D) $\frac{1}{9}$

12- $3 + 5 + 7 + \dots\dots\dots + (2n+5) = (n+2)(n+4)$ for integral values of n
(A) $n \geq -4$ (B) $n \geq -3$ (C) $n \geq -2$ (D) $n \geq -1$

13- $\binom{n}{1} + \binom{n}{3} + \binom{n}{5} + \dots\dots\dots + \binom{n}{n-1} =$
(A) 2^{n+2} (B) 2^{n-2} (C) 2^{n-1} (D) 2^{n+1}

14- $\cot^2\theta - \operatorname{cosec}^2\theta =$
(A) 1 (B) -1 (C) $\cos^2\theta$ (D) $\tan^2\theta$

(2) Guj-11-2-23

15- $\tan 3\theta =$
(A) $\frac{3\tan\theta - \tan^3\theta}{1 - 3\tan^2\theta}$ (B) $\frac{3\tan^2\theta - \tan\theta}{1 - 3\tan^3\theta}$ (C) $3\tan\theta$ (D) $\tan^3\theta$

16- Range of $y = \sin x$ is
(A) $[-1, 1]$ (B) $\left[-\frac{1}{2}, \frac{1}{2}\right]$ (C) $[-2, 2]$ (D) $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$

17- Number of elements of a triangle is
(A) 4 (B) 5 (C) 6 (D) infinite

18- $\cos\frac{\beta}{2} =$
(A) $\sqrt{\frac{s(s-b)}{ac}}$ (B) $\sqrt{\frac{(s-c)(s-a)}{ac}}$
(C) $\sqrt{\frac{s(s-a)}{bc}}$ (D) $\sqrt{\frac{(s-b)(s-c)}{bc}}$

19- $\sin(\tan^{-1}(-1)) =$
(A) 1 (B) -1 (C) $\frac{1}{\sqrt{2}}$ (D) $\frac{-1}{\sqrt{2}}$

20- Reference angle of $2\sin x - 1 = 0$ is
(A) $\frac{\pi}{3}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{6}$ (D) $\frac{\pi}{2}$

MATHEMATICS **Intermediate Part-I, Class 11th (1st A 323)** **PAPER: I** **GROUP: II**

SUBJECTIVE

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

Note: Section-I is compulsory. Attempt any three (3) questions from Section-II. (4)

SECTION-I

Guj-11-2-23

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

i- State the DeMoiver's theorem.

ii- Factorize $9a^2+16b^2$

iii- Write down two proper subsets of $\{0, 1\}$

iv- Construct truth table $(p\to\sim p)\vee(p\to q)$

v- Define unary and binary operations.

vi- Find matrix X if $X\begin{bmatrix}5 & 2\\ -2 & 1\end{bmatrix}=\begin{bmatrix}-1 & 5\\ 12 & 3\end{bmatrix}$

vii- Solve the following system of linear equations

$3x_1-x_2=1\ ,\ x_1+x_2=3$

viii- If $A=\begin{bmatrix}2 & -1\\ 3 & 1\end{bmatrix}$, verify that $(A^{-1})^t=(A^t)^{-1}$

ix- Solve the equation $x^{2/5}+8=6x^{1/5}$

x- Find four fourth roots of 16

xi- Discuss the nature of the roots of a quadratic equation $x^2+2x+3=0$

xii- When the polynomial x^3+2x^2+kx+4 is divided by $x-2$, the remainder is 14. Find the value of k

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

i- Define rational fraction.

ii- Write down the first four terms of the sequence, if $a_n=n\cdot a_{n-1}$, $a_1=1$

iii- Find the 13th term of the sequence $x, 1, 2-x, 3-2x, \dots\dots\dots$

iv- Find the nth term of geometric sequence, if $\frac{a_5}{a_3}=\frac{4}{9}$ and $a_2=\frac{4}{9}$

v- Sum to n terms of the series $3+33+333+\dots\dots\dots$

vi- Find the 9th term of H.P. $\frac{1}{3}, \frac{1}{5}, \frac{1}{7}, \dots\dots\dots$

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

viii- What is the probability that a slip of numbers divisible by 4 is picked from the slips bearing numbers $1, 2, 3, \dots\dots\dots, 10$?

ix- If sample space $S=\{1, 2, 3, \dots\dots\dots, 9\}$, event $A=\{2, 4, 6, 8\}$ and event $B=\{1, 3, 5\}$. Find $P(A\cup B)$

x- Prove by mathematical induction $r+r^2+r^3+\dots\dots\dots+r^n=\frac{r(1-r^n)}{1-r}$, $r\neq 1$

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

xii- Evaluate $\sqrt[3]{30}$ correct to three places of decimal.

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

i- Write down any two fundamental trigonometric identities.

ii- In which quadrant the terminal arm of the angle lie when $\sin\theta<0$ and $\cos\theta>0$

iii- Verify $\sin 60^\circ\cos 30^\circ-\cos 60^\circ\sin 30^\circ=\sin 30^\circ$

iv- Prove that $\sin 3\alpha=3\sin\alpha-4\sin^3\alpha$

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

vi- Express $\sin(x+30^\circ)+\sin(x-30^\circ)$ as product.

(Turn Over)

vii- Write domain and range of $\sin\theta$

viii- A ladder leaning against a vertical wall makes an angle of 24° with the wall. Its foot is 5m from the wall. Find its length.

ix- Find the area of the triangle ABC, if $a = 18$, $b = 24$, $c = 30$

x- Prove that $r_1 r_2 r_3 = rs^2$

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

xii- Find the value of $\sin\left(\cos^{-1}\frac{\sqrt{3}}{2}\right)$

xiii- Prove the identity $\sin^{-1}x = \frac{\pi}{2} - \cos^{-1}x$

SECTION-II

Note: Attempt any three (3) questions.

5- **(a)** Reduce the matrix $\begin{bmatrix} 2 & 3 & -1 & 9 \\ 1 & -1 & 2 & -3 \\ 3 & 1 & 3 & 2 \end{bmatrix}$ into echelon form **5**

(b) Solve the equation $(x+4)(x+1) = \sqrt{x^2+2x-15} + 3x + 31$ **5**

6- **(a)** Resolve $\frac{(x-1)(x-3)(x-5)}{(x-2)(x-4)(x-6)}$ into partial fractions. **5**

(b) Find the values of n and r, when ${}^nC_r = 35$ and ${}^nP_r = 210$ **5**

7- **(a)** Find n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be H.M. between 'a' and 'b'. **5**

(b) Use mathematical induction to prove the formula for every positive integer n **5**

$$1+\frac{1}{2}+\frac{1}{4}+\dots\dots\dots+\frac{1}{2^{n-1}} = 2\left[1-\frac{1}{2^n}\right]$$

8- **(a)** If $\operatorname{Cosec}\theta = \frac{m^2+1}{2m}$ and $m > 0$ $\left(0 < \theta < \frac{\pi}{2}\right)$, **5**

Find values of remaining trigonometric ratios.

(b) Prove that $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$ **5**

9- **(a)** Prove that $\Delta = 4Rr \cdot \cos\frac{\alpha}{2} \cdot \cos\frac{\beta}{2} \cdot \cos\frac{\gamma}{2}$ **5**

(b) Prove that $\sin^{-1}\frac{1}{\sqrt{5}} + \cot^{-1}3 = \frac{\pi}{4}$ **5**

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 4 x 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- $\text{Sin } 540^\circ =$

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

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)

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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

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.

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)

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

(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) $-1 \leq x \leq 1$ (B) $-\infty < x < \infty$ (C) $-1 \leq y \leq 1$ (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) $\{n\pi\}$

(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 $\forall\ Z \in C \quad Z^2 + \bar{Z}^{-2}$ 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 $5, 2, -1, \ldots\ldots$ is -85 ?

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

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

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 $y = \frac{2}{5} + \frac{1.3}{2!}\left(\frac{2}{5}\right)^2 + \frac{1.3.5}{3!}\left(\frac{2}{5}\right)^3 + \dots\dots\dots$, 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

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