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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 $1, \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \ldots\ldots\ldots$ is

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

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

(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) $-1 \le x \le 1$ (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) $\{n\pi\}$

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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: $\quad (1 + \omega - \omega^2)(1 - \omega + \omega^2)$

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

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 $\dfrac{1}{3}, \dfrac{1}{5}, \dfrac{1}{7}, \ldots\ldots\ldots$

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)

GUJ-G2-21

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

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

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

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

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

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

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

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

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

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 $\sec[\sin^{-1}(-\tfrac{1}{2})]$

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

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

6- (a) Resolve $\dfrac{2x+1}{(x+3)(x-1)(x+2)^2}$ 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 $y = \dfrac{2}{5} + \dfrac{1.3}{2!}\left(\dfrac{2}{5}\right)^2 + \dfrac{1.3.5}{3!}\left(\dfrac{2}{5}\right)^3 + \ldots\ldots$, 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 $\dfrac{\cos 8^\circ - \sin 8^\circ}{\cos 8^\circ + \sin 8^\circ} = \tan 37^\circ$ **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 $\tan^{-1}\left(\dfrac{1}{11}\right) + \tan^{-1}\left(\dfrac{5}{6}\right) = \tan^{-1}\left(\dfrac{1}{3}\right) + \tan^{-1}\left(\dfrac{1}{2}\right)$ **5**