PRE BOARD EXAMINATION 2019

XI $\sum$ ATHEMATICS

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PAPER B

Max. Marks: 20 **Time: 20 minutes**

Section A" (Multiple Choice Questions)

Q1. Choose the correct answer for each from the given options.

i) $\forall\, a, b \in R, a = b$ and $b = a$, this property is
a. Transitive b. $symmetric$ c. Reflexive d. Additive

ii) If $z = -2 - 3i$, then the value of $z - \overline{z}$ is
a. -4 b. $6i$ c. $-6i$ d. $4i$

iii) The real part of $\frac{3}{\sqrt{6}-\sqrt{-12}}$ is
a. $\sqrt{6}$ b. $\frac{3}{\sqrt{6}}$ c. $\frac{1}{\sqrt{6}}$ d. $\frac{1}{3}$

iv) The nature of roots of $x^2 - 2x + 1 = 0$
v) complex b. rational c. Irrational d. $real\ and\ equal$

If ω is a cube root of unity, then an equation whose roots are 3ω and $3\omega^2$ will be
a. $x^2 + 3x + 6 = 0$ b. $x^2 - 9x - 3 = 0$ c. $x^2 - 3x - 9 = 0$ d. $x^2 + 3x + 9 = 0$

vi) $\omega^{32} + \omega^{35} + i^6 =$
b. -1 b. $2\omega^2 - 1$ c. 0 d. $\omega^2 + 1$

vii) In a square matrix, $A = [a_{ij}]$, if $a_{ij} = 0\ \forall\ i \neq j$ and $a_{ij} = k\ \forall\ i = j$, then matrix A is called
a. unit b. diagonal c. null d. $scalar$

viii) If $A = \begin{bmatrix} x & 1 \\ 1 & 1 \end{bmatrix}$ is a singular matrix the x =
c. 3 b. 2 c. 1 d. 0

ix) If $a_n = (n+1)a_{n-1}$ where $a_1 = 1$ then the value of a_3 is
a. 12 b. 10 c. 8 d. 4

x) The sum of infinite G.P. $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \ldots$
a. 9 b. 4 c. 2 d. 0

xi) A sequence is said to be harmonic sequence is the reciprocal of its terms are in
a. $A.P.$ b. G.P. c. arithmetic mean d. harmonic mean

xii) Sum of the series $1^3 + 2^3 + 3^3 + \ldots + n^3 =$
a. $\frac{n}{2}$ b. $\frac{n(n+2)}{2}$ c. $\frac{(n+3)^2}{6}$ d. $\frac{n^2(n+1)^2}{4}$

xiii) For geometric sequence $2^{\frac{1}{2}} \cdot 4^{\frac{1}{8}} \cdot 8^{\frac{1}{24}} \cdot 16^{\frac{1}{64}} \ldots =$
a. 0 b. 1 c. 2 d. 4

xiv) The sum of the series $1 + 3 + 5 + \ldots$ to 9 terms
a. 9 b. 25 c. 80 d. 81

xv) The 20th term of an H.P. of which first two terms are $\frac{2}{39}$ and $\frac{2}{37}$
a. -2 b. 1 c. 0 d. 2

xvi) The circle passing through the vertices of triangle is
a. unit b. escribed c. $circum - circle$ d. in-circle

xvii) The range of cotx is
a. R^- b. R c. $[-1,1]$ d. R^+

xviii) The solution set of equation $1 + cosx = 0$ is
a. $\{\pi + n\pi\}\ n \in \mathbb{Z}$ b. $\{2\pi + n\pi\}\ n \in \mathbb{Z}$ c. $\{\pi + 2n\pi\}\ n \in \mathbb{Z}$ d. $\left\{\frac{3\pi}{2} + n\pi\right\}\ n \in \mathbb{Z}$

xix) $\cos\left(\frac{3\pi}{2} - \theta\right) =$
a. $\sin(\pi + \theta)$ b. $\sec(\pi + \theta)$ c. $\sin(2\pi - \theta)$ d. $\tan(\pi + \theta)$

xx) $\frac{19\pi}{3}$ radians in degree
a. 120^0 b. 1140^0 c. 45^0 d. 30^0

PAPER B

SECTION 'B'
(SHORT –ANSWER QUESTIONS) (50 marks)

NOTE: **Attempt any TEN part questions from this Section, Selecting at least THREE part questions from each question. All questions carry equal marks.**

COMPLEX NUMBER, ALGEBRA AND MATRICES

Q-2.

i) Express the complex number $\frac{(1+\sqrt{3}i)^2}{\sqrt{3}-i}$ in the form of $a + bi$

ii) Solve the equation $y^{-6} - 9y^{-3} + 8 = 0$

iii) Prove that the roots of the following equations are real $(b^2 - 4ac)y^2 + 4(a + c)y - 4 = 0$

OR

Find the equation whose roots are double the roots of $y^2 - qy + p = 0$

iv) Using properties of determinant prove that $\begin{vmatrix} -a & 0 & c \\ 0 & a & -b \\ b & -c & 0 \end{vmatrix} = 0$

v) Find the value of *k* if $M = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $M^2 - kM - I_2 = 0$, where I_2 is identity matrix of order 2

SEQUENCES AND SERIES MATHEMATICAL INDUCTION

Q-3.

i) Prove by mathematical induction that $a^{2n} - b^{2n}$ is divisible by (a + b) for all n ∈ N.

ii) In an H.P the 10^{th} term is 35 and 34^{th} term is 25. If the last term is 2, find the numbers of terms.

iii) Prove by Mathematical induction $2 + 6 + 12 + \ldots\ldots\ldots + n(n + 1) = \frac{1}{3} n(n + 1)(n + 2)\ \forall\ n \in N$.

iv) Express $0.3\dot{4}\dot{8}$ as a vulgar fraction.

v) If *a,b,c* are in A.P, then prove that $b + c, c + a, a + b$ are also in A.P

TRIGONOMETRY

Q- 4.

i) Derive the law of cosines $a^2 = b^2 + c^2 - 2bc\cos\alpha$

ii) Find the solution set of $tan2\theta cot\theta = 3$

iii) Draw the graph of $sin^2\theta$, where $0 \le \theta \le 2\pi$.

iv) While flying at a height of 1200 meters, a pilot observes the measure of the angle of depression of an airport to be 30^0 and that of a town to be 20^0. Find the distance between the town and the airport.

v) Prove that: $\tan^{-1}\frac{1}{3} + \frac{1}{2}\tan^{-1}\frac{1}{7} = \frac{\pi}{8}$

SECTION "C"

(Detailed-Answer Question) **(30 marks)**

Note: Attempt TWO questions from this Section, including question number 5 which is compulsory.

Q-5.

a) Which term of the sequence $18, 12, 8, \ldots\ldots\ldots$ is $\frac{512}{729}$ 3

b) The product of three numbers in G.P is 216 and the sum of their products in pairs is 156 find the numbers. 5

c) Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may become the A.M between a and b 6

Q-6.

a) Prove that $\tan 3\theta = \frac{3\tan\theta - \tan^3\theta}{1-3\tan^2\theta}$ 5

b) Solve the triangle ABC in which $a = 200cm,\ b = 120cm,\ \gamma = 150°$ 5

c) Apply Cramer's rule to solve following system of equation 6

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

Q-7.

a) Solve the following system of 8

$$x^2 - 5xy + 6y^2 = 0$$
$$x^2 + y^2 = 45$$

b) Prove ANY Two from the following: 4

a. $\frac{cosec\theta}{cosec\theta - 1} + \frac{cosec\theta}{cosec\theta + 1} = 2\sec^2\theta$ b. $(sec\theta - tan\theta)^2 = \frac{1-sin\theta}{1+sin\theta}$

c. $sin^6\theta - cos^6\theta = 1 - 3sin^2\theta cos^2\theta$

c) Using Mathematical Induction, prove that $2^{3n+2} - 28n - 4$ is divisible by 49, $\forall\ n \in N$ 4