Roll No. ________________

Code : 112017-041-A

Please check that this question paper contains **26** questions and **4** printed pages.

CLASS-XI
MATHEMATICS

Time Allowed : 3 Hours **Maximum Marks : 100**

- *Please check that this question paper contains 4 printed pages and 26 questions.*
- *Write down the serial number of the question before attempting it.*
- *There is reading time for 15 minutes. Students will read the question paper during this time and will not write any answer on the answer script during this period.*

General Instructions :

1. *This question paper consists of 26 questions divided into three sections.*
   Section A consists of 6 questions of 1 mark each.
   Section B consists of 13 questions of 4 marks each.
   Section C consists of 7 questions of 6 marks each.
2. *There is no overall choice. However, internal choice is given in four questions of 4 marks each and two questions of 6 marks each.*
3. *Use of calculator is not permitted.*

Section–A

Question number 1 to 6 carry 1 mark each.

1. If ${}^5P_r = 2\,{}^6P_{r-1}$, find the value of r.

2. Find the modulus of $(1 - i)^{10}$.

3. Find the distance between the lines $mx + y = 1$ and $x + \frac{y}{m} = m$.

4. Write the Negation of the following statement :
   For every real number x, $x^2 > 0$

5. Identify and write the necessary condition and sufficient condition in the following statement :
   A natural number is even if it is divisible by 2

6. What does the equation $xy - x - y + 1 = 0$ become if origin is shifted to point (1, 1) ?

Section–B

Question number 7 to 19 carry 4 marks each.

7. In order to sensitize the students and people in the neighbourhood against "Eve teasing and crimes against women" the students of class XI of a DAV school organized various activities.

   Out of 100 students of class XI, 40 participated in a rally, 15 participated in street play, 20 participated in group song, 5 participated in both rally and street play, 3 participated in both street play and group song, 1 participated in rally and group song, none of them participated in all three activities. Find the number of students who did not participate in any of these activities.

   What values are shown by the students who participated in these activities ?

8. For any two sets A and B, Prove that $P(A) = P(B) \Rightarrow A = B$ where P(A) and P(B) denote power sets of A and B respectively.

   How many elements are there in $P(P(\phi))$?

9. Find the domain and range of $f(x) = \dfrac{3}{\sqrt{9 - x^2}}$.

   OR

   A relation R is defined on set of non-negative integers as $R = \{(x, y) : x^2 + y^2 = 100\}$. Write R in roster form. Also write the domain and range of R.

10. In any ΔABC, prove that $\dfrac{\cos^2 B - \cos^2 C}{b + c} + \dfrac{\cos^2 C - \cos^2 A}{c + a} + \dfrac{\cos^2 A - \cos^2 B}{a + b} = 0$

11. How many words with or without meaning can be made using the letters of the word "FESTIVAL" taken all at a time ? In how many of them vowels occupy odd places ?

    OR

    A group consits of 5 girls and 6 boys. In how many ways can a team of 4 members be selected if the team has

    (i) at least one boy and one girl (ii) at most 2 boys.

12. If $f(x)$ denotes the sum of infinite terms of series

$1 - \cos x + \cos^2 x - \cos^3 x + \cos^4 x - \ldots\ldots\ldots .(x \neq n\pi)$ and

$g(x)$ denotes the sum of infinite terms of series :

$1 + \sin x + \sin^2 x + \sin^3 x + \ldots\ldots\ldots(x \neq (2n+1)\frac{\pi}{2}$

Find all possible values of x for which $f(x) = g(x)$.

OR

If a, b and c are in A.P and $ab + bc + ca \neq 0$ then prove that $a^2(b + c)$, $b^2(a + c)$, $c^2(a + b)$ are also in A.P.

13. If is given that $\sin 18° = \frac{\sqrt{5}-1}{4}$, find the value of cos36° and sin72°.

14. A point P lies on line segment AB such that 3PA = 2PB, if coordinates of A and B are (– 2, – 3, 3) and (13, – 3, 13) respectively. Find the coordinates of P.

15. Find the equation of ellipse with centre at origin, eccentricity $\frac{\sqrt{3}}{2}$ coordinates of foci are (1, 0) and (– 1, 0).

16. Find the derivative of $\cos x^2$ by first principle.

OR

If $f(x) = \frac{\sec x - 1}{\sec x + 1}$, prove that $\frac{f(x)}{f'(x)} = \frac{\sin x}{2}$.

17. A and B are two mutually exclusive and exhaustive events of a random experiment such that $P(A) = 6[P(B)]^2$ where P(A) and P(B) denotes probabilities of A and B respectively. Find P(A) and P(B).

18. Find the square root of $Z = \frac{-22 + 19i}{2 + i}$.

19. Evaluate $\lim_{x \to 0} \frac{\cos 2x - \cos 3x}{\cos 4x - 1}$.

Section–C

Question number 20 to 26 carry 6 marks each.

20. The hypotenuse of isosceles right triangle lies along the line $2x - y = 4$ and vertex opposite to hypotenuse is (1, 5). Obtain the equations of other two sides.

21. Prove that $\dfrac{\cos 8A \cos 5A - \cos 12A \cos 9A}{\sin 8A \cos 5A + \cos 12A \sin 9A} = \tan 4A$.

OR

Find the general solution of following trigonometric equation :

$\cos^2 x \operatorname{cosec} x + 3\sin x + 3 = 0$

22. The coefficients of 2^{nd}, 3^{rd} and 4^{th} terms in the expansion of $(1 + x)^{2n}$ are in A.P. Find the value of n.

OR

Find the seventh term from the end in the expansion of $(x^{\frac{1}{3}} + y^{\frac{1}{2}})^n$, if the coefficient of third term is 45.

23. Solve the following system of in-equations graphically :

$x + 2y \leq 8,\ \ 2x + y \geq 2,\ \ x - y \leq 1,\ \ x \geq 0,\ \ y \geq 0$

24. Find the sum of first 20 terms of the series :

$$1 + \frac{1+2}{2} + \frac{1+2+3}{3} + \frac{1+2+3+4}{4} + \ldots\ldots\ldots\ldots\ldots$$

25. Using principle of mathematical induction, prove that

$(1 + x)^n \geq 1 + nx$ where $n \in N$ and $x > -1$.

26. Calculate the mean deviation about mean for the following data :

Class	0–10	10–20	20–30	30–40	40–50	50–60	60–70
Frequency	2	3	8	14	8	3	2