Question Paper (2015-2016) set 5
CBSE Class XI Mathematics

General Instruction:

- All the questions are compulsory.
- The Question Paper consists of 26 Questions divided into three sections A, B and C
- Section-A comprises of 6 questions of one mark each.
- Section-B consists of 13 questions of four marks each.
- Section-C comprises of 7 questions of Six marks each.
- There is no overall choice. However, an internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
- Use of calculator is not permitted.

SECTION – A

1. If R is a relation from set A having 3 elements to a set B having 2 elements, then find the number of relations from A to B.

2. Find the value of $(1 + i)(1 + i^2)(1 + i^3)(1 + i4)$.

3. Write the converse of the following statement 'If a number n is even, then n^2 is even'.

4. Express the following statement by appropriate symbol 'She is rich and beautiful.'

5. Find the centre and radius of the circle $2(x + 1)^2 + 2y^2 = 25$.

6. Write the negation of the following statement 'Every natural number is an integer'.

Section B

7. If R is a relation in N, defined as $R = \{(x, y) \in N \times N : x + 2y = 36\}$. Then, find the domain and range of R.

OR

If A= {1, 2, 3, 4}, B = {0, 7} and C = {4}, then verify that A $A \times (B \cup c) = (A \times B) \cup (A \times C)$

8. Prove that: $\dfrac{\sin(B-C)}{\cos B \cos C} + \dfrac{\sin(C-A)}{\cos C \cos A} + \dfrac{\sin(A-B)}{\cos A \cos B} = 0.$

9. Prove that: $\dfrac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

10. Find the square roots of 9 + 40i.

11. A milk of 80% concentration is diluted at home by the seller by adding some water to it, so that milk concentration is reduced between 65% to 70%. If 640 L of milk of 80% concentration is available, then how much water has been added? Which value system, the seller is lacking?

12. How many words can be formed from the letters of the word 'DAUGHTER', so that vowels are always together?

OR

In an examination, a question paper consists of 12 questions divided into two parts, i.e.,Part I and Part II, containing 5 and 7 questions, respectively. A student is required to attempt 8 questions in all, selecting atleast 3 from each part. In how many ways, can a student select the questions?

13. Find the general solution of $\sec^2 2x = 1 - \tan 2x$.

14. Find the equation of the straight line which has Y-intercept equal to $\dfrac{4}{3}$ and is perpendicular to 3x–4y+11 = 0.

15. An equilateral triangle is inscribed in a parabola y^2 = 4ax, whose vertex is at the vertex of the parabola. Find the length of its side.

OR

Find the equation of circle of radius 5, whose centre lies on X-axis and passes through the point (2,3).

16. Using section formula, show that the points A (2, - 3, 4), B (-1, 2,1) and are $c\left(0, \frac{1}{3}, 2\right)$ collinear.

17. Calculate the mean deviation from the median for the following distribution.

x_i	10	15	20	25	30	35	40	45
f_i	7	3	8	5	6	8	4	3

18. Find the probability of getting an even number on the first die or a total of 8 in a single throw of two dice.

OR

A drawer contains 50 bolts and 150 nuts. Half of the bolts and half of the nuts are rusted. If one item is chosen at random, then what is the probability that it is rusted or a bolt?

19. In a survey of 30 villages of a state, about the use of LPG as a cooking mode, the following information 'about the families using LPG was obtained'.

Number of families	0-30	30-60	60-90	90-120	120-50	150-180	180-210
Number of villages	2	3	5	10	3	5	2

Find the mean and variance for the following data. Do you think more awareness was needed for the villages to use LPG as a mode of cooking?

Section C

20. In a survey conducted on a group of 1800 people, it is found that 1200 people liked tea and 900 people like coffee. What is the least number of people who like both tea and coffee, given that 500 people did not like any of tea and coffee?

Which value is depicted from this question?

21. Prove that: $2\cos\dfrac{\pi}{3}\cos\dfrac{9\pi}{13}+\cos\dfrac{3\pi}{13}+\cos\dfrac{5\pi}{13}=0$

22. Prove by Principle of Mathematical Induction that $1^2+2^2+3^2+....+n^2>\dfrac{n^3}{3}$ for all $n\in N$.

OR

Using Principle of Mathematical Induction, prove that 4 15 1 n + − n is divisible by 9 for all $n\in N$.

23. Solve the following system of inequations graphically

5x + y ≥ 10, 2x + 2y ≥ 12

x + 4y ≥ 12, x ≥ 0, y ≥ 0

24. Find the coefficient of a4 in the product $(1 + 2a)^4 (2 – a)^5$, using binomial theorem.

25. Show that the ratio of the sum of first n terms of a GP to the sum of terms from (n + 1)th to (2n)th term

OR

If a, b, care in GP and the equations $ax^2 + 2bx + c = 0$ and $dx^2 + 2ex + f = 0$ have a common root, then show that $\dfrac{d}{a},\dfrac{e}{b},\dfrac{f}{c}$ are in AP.

26. (i) Differentiate $\sin^2 x$ with respect to x from I principle.

(ii) Evaluate: $\displaystyle\lim_{x\to 0}\dfrac{1-\cos 4x}{1-\cos 5x}$