

Please check that this question paper contains **29** questions and **4** printed pages.

**CLASS-XI**  
**MATHEMATICS**

**Time Allowed : 3 Hrs.**

**Maximum Marks : 100**

- *Please check that this question paper contains 4 printed pages.*
- *Please check that this question paper contains 29 questions.*
- *Please write down the serial number of the question before attempting it.*
- *15 minutes time has been allotted to read this question paper. The question paper will be distributed at 9:30 a.m. from 9:30 a.m. to 9:45 a.m., the student will read the question paper only and will not write any answer on the answer script during this period.*

**General Instructions :**

1. *Question paper consists of 29 questions divided into three sections. Section A consists of 10 questions of 1 mark each, Section B consists of 12 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 and two questions of 6 marks. In these cases, you have to attempt one out of the given two options.*
3. *Use of calculators is not permitted.*

**Section-A**

1. Write the set  $A = \{1, 4, 9, 16, 25\dots\}$  in set builder form. (1)
2. If  $A = \{1, 2\}$ , form the set  $A \times A \times A$  (1)
3. Evaluate  $\lim_{x \rightarrow 0} \frac{\sin ax}{bx}$ ;  $a, b \neq 0$  (1)
4. Evaluate  $(-\sqrt{-1})^{4n+3}$ ,  $n \in \mathbb{N}$  (1)
5. Multiply  $3 - 2i$  by its conjugate. (1)

6. Find the derivative of  $x^3 \sec x$  w.r.t. ' $x$ '. (1)
7. Find the equation of line through  $(-2, 3)$  with slope  $-4$ . (1)
8. Write the converse of the following statement : (1)  
If a number  $n$  is odd, then  $n^2$  is odd
9. Write the contrapositive of the following statement : (1)  
If a number is divisible by 9, then it is divisible by 3.
10. If  $P(E' \cap F') = 0.87$  (1)  
find  $P(E \cup F)$

### Section-B

11. Prove  $\tan 4x = \frac{4 \tan x (1 - \tan^2 x)}{1 - 6 \tan^2 x + \tan^4 x}$  (4)

**OR**

Sketch the graph of  $y = \sin x, -\pi \leq x \leq \pi$  (4)

12. Solve for  $x$  : (4)  
 $\sin 2x - \sin 4x + \sin 6x = 0$

13. Find the domain and range of the function  $f(x)$  given by  $f(x) = \sqrt{9 - x^2}$  (4)

14. Let A and B be two sets. If  $A \cap X = B \cap X = \phi$  (4)  
and  $A \cup X = B \cup X$  for some set X,  
Show that  $A = B$ .

15. Using principle of Mathematical Induction, prove that  $x^{2n} - y^{2n}$  is divisible by  $x + y$  (4)  
where  $n \in \mathbb{N}$

**OR**

Using principle of Mathematical Induction, prove that (4)

$$1^2 + 2^2 + 3^2 + 4^2 + \dots + n^2 = \frac{n(n+1)(2n+1)}{6}, \text{ where } n \in \mathbb{N}.$$

16. If origin is the centroid of the triangle PQR with vertices P  $(2a, 2, 6)$ , Q  $(-4, 3b, -10)$  and R  $(8, 14, 2c)$ . Find the values of  $a, b$  and  $c$ . (4)

17. Find the modulus and argument of the complex number  $\frac{1 + 2i}{1 - 3i}$  (4)

18. Find the number of words with or without meaning which can be made using all the letters of the word "AGAIN". If these words are written as in a dictionary, what will be 49th word ? (4)

19. Find the equation of the ellipse, with major axis on the  $x$ -axis and passes through the points (4, 3) and (6, - 2). (4)

**OR**

Find the equation of the circle passing through the points (4, 1) and (6, 5) and whose centre is on the line  $4x + y = 16$ . (4)

20. The sum of first three terms of a GP is  $\frac{39}{10}$  and their product is 1. Find the common ratio and the terms. (4)

21. Differentiate  $f(x) = x \cos x$  with respect to 'x' from the first principle. (4)

22. A box contains 9 red, 7 white and 4 black balls. If two balls are drawn at random, find the probability that (4)

- (i) both the balls are red
- (ii) one ball is white

**OR**

If E and F are two events such that  $P(E) = \frac{1}{4}$ ,  $P(F) = \frac{1}{2}$  and  $P(E \text{ and } F) = \frac{1}{8}$ , find (4)

- (i)  $P(E \text{ or } F)$  (ii)  $P(\text{not } E \text{ and not } F)$  (iii)  $P(E \text{ but not } F)$  (iv)  $P(F \text{ but not } E)$

**Section-C**

23. Of the members of three sports teams in a certain school, 21 are in the basket ball team, 26 in the hockey team and 29 in the football team, 14 play hockey and basket ball, 15 play hockey and football, 12 play football and basket ball and 8 play in all the three games. (6)

- (i) How many members are there in all ?
- (ii) How many are in only basketball team ?
- (iii) How many are in only football team ?

24. Prove that  $\sin 10^\circ \sin 30^\circ \sin 50^\circ \sin 70^\circ = \frac{1}{16}$  (6)

25. Solve the following system of inequalities graphically : (6)

$$5x + 4y \leq 40$$

$$x \geq 2$$

$$y \geq 3$$

26. The coefficients of three consecutive terms in the expansion of  $(1 + a)^n$  are in the ratio 1 : 7 : 42. Find 'n' (6)

**OR**

Using Binomial theorem, show that

$$9^{n+1} - 8n - 9 \text{ is divisible by } 64, \text{ whenever } n \text{ is a positive integer.} \quad (6)$$

27. Find the sum of the series :

$$7 + 77 + 777 + 7777 + \dots \text{ to } n \text{ terms.} \quad (6)$$

28. Find the distance of the line  $4x + 7y + 5 = 0$  from the point (1, 2) along the line  $2x - y = 0$ . Also find the perpendicular distance of the point (1, 2) from the line  $4x + 7y + 5 = 0$  (6)

**OR**

If  $p$  and  $q$  are the lengths of perpendiculars from the origin to the lines  $x \cos\theta - y \sin\theta = k \cos 2\theta$  and  $x \sec \theta + y \operatorname{cosec} \theta = k$ , respectively. Prove that  $p^2 + 4q^2 = k^2$  (6)

29. Calculate the mean deviation about median for the following data: (6)

Class	0-10	10-20	20-30	30-40	40-50	50-60
frequency	6	7	15	16	4	2