CLASS-XI

SUB: MATHEMATICS

TIME ALLOWED: 3 HOURS **MM: 100**

General Instructions

1. All questions are compulsory.
2. The question paper consist of 26 questions divided into three sections A, B and C. Section A comprises of 6 questions of one mark each, section B comprises of 13 questions of four marks each and section C comprises of 07 questions of six marks each.
3. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
4. There is no overall choice. However, internal choice has been provided in 04 questions of four marks each and 02 questions of six mark each. You have to attempt only one of the alternatives in all such questions.
5. Use of calculators is not permitted. You may ask for logarithmic tables, if required.

SECTION- A

1. If A = {-1,1}, B= {0,1} find A × B. **1**

2. A convex polygon has 65 diagonals. Find the number of sides of the polygon. **1**

3. Write the equation of Ellipse whose length of major axis is 8 and minor axis is 6. **1**

4. Write the negation of the statement: "Australia is a continent." **1**

5. Write the contrapositive of the statement: "If you are born in India, then you are a citizen of India." **1**

6. Write the converse of the statement "if a number nis even, then n^2 is even". **1**

SECTION-B

7. If $U=\{1,2,3,4,5,6,7,8,9\}$, $A=\{2,4,6,8\}$ and $B=\{3,4,5,6\}$, verify the following:

(i) $(A\cup B)' = A'\cap B'$ (ii) $(A\cap B)' = A'\cup B'$. **4**

8. Determine domain and range of the function $f=\left\{\left(x,\frac{1}{1-x^2}\right): x\in R, x\neq \pm 1\right\}$

4

9. A tree stands vertically on a hill side which makes an angle of 15^0 with the horizontal. From a point on the ground 35m down the hill from the base of the tree, the angle of elevation of the top of the tree is 60^0.Prove that the height of the tree is $35\sqrt{2}m.$

4

OR

The angle of elevation of the top point P of the vertical tower PQ of height ***h*** from a point A is 45^0 and from a point B, the angle of elevation is 60^0, where B is a point at a distance ***d*** from the point A measured along the line AB which makes an angle 30^0 with AQ. Prove that $\boldsymbol{d} = \left(\sqrt{3}-1\right)h.$

10. Prove that: $\cos 2x \cos\frac{x}{2} - \cos 3x \cos\frac{9x}{2} = \sin 5x \sin\frac{5x}{2}.$ **4**

11. If α and β are different complex numbers with $|\beta| = 1,$ then find $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|.$ **4**

OR

Find the square root of the complex number: $5+12i$

12. Find the number of different 8-letter arrangements that can be made from the letters of the word DAUGHTER so that, <u>all vowels do not occur together</u>. **2**

Write any two ways, which we should encourage to insure <u>gender sensibility</u> in our society. **2**

13. If the sum of first *p* terms of an A.P. is equal to the sum of the first *q* terms, then find the sum of the first (*p* + *q*) terms. **4**

14. Two lines passing through the point (2, 3) intersects each other at an angle of 60^0. If slope of one line is 2, find equation of the other line. **4**

OR

Find the distance of the line $4x+7y+5=0$ from the point $(1,2)$ measured parallel to the line $2x-y+5=0$.

15. Find the equation of the circle passing through the points (2,3) and (–1,1) and whose centre is on the line $x - 3y - 11 = 0$ **4**

OR

An equilateral triangle is inscribed in the parabola $y^2 = 4ax$ where one vertex is at the vertex of the parabola. Find the length of the side of the triangle.

16. Find the point on YZ-plane which divides the line segment formed by joining the points (–2, 4, 7) and (3, –5, 8). **4**

17. Find the variance and standard deviation for the following data: **4**

X_i	**4**	**8**	**11**	**17**	**20**	**24**	**32**
f_i	**3**	**5**	**9**	**5**	**4**	**3**	**1**

18. A box contains 6 red marbles, 5 blue marbles and 4 green marbles.
3 marbles are drawn from the box, what is the probability that
a) all will be blue?
b) at least one will be green? 4

19. In a class of 60 students, 30 opted for NCC, 32 opted for NSS and 24 opted for both NCC and NSS. If one of these students is selected at random, find the probability that
a) The student opted for NCC or NSS
b) The student has opted NCC but not NSS 4

SECTION-C

20. In a survey of 60 people ,it was found that 25 people read newspaper H,26 read newspaper T,26 read newspaper I,9 read newspaper H and I,11read both H and T,8 read both T and I,3 read all three newspapers. Find:

i. the number of people who read exactly one newspaper. **2**

ii. the number of people who read neither of the newspaper. **2**

iii. **"Newspaper reading is a good habit**", justify this statement in brief. **2**

21. (i) Prove that: $\left(1+\cos\frac{\pi}{8}\right)\left(1+\cos\frac{3\pi}{8}\right)\left(1+\cos\frac{5\pi}{8}\right)\left(1+\cos\frac{7\pi}{8}\right)=\frac{1}{8}$ **4**

(ii)Prove that: $\cos\left(\frac{\pi}{4}-x\right)+\cos\left(\frac{\pi}{4}+x\right)=\sqrt{2}\cos x$ **2**

22. Using principle of mathematical induction ,Prove that: $2.7^n+3.5^n-5$ is divisible by $24, \forall n \in N.$ **6**

OR

Prove that : $1.3+3.5+5.7+.....+(2n-1)(2n+1)=\frac{n(4n^2+6n-1)}{3}, \forall n \in N.$

23.Solve the given system of inequalities graphically:

$x+2y\le 10, x+y\ge 1, x-y\le 0, x\ge 0, y\ge 0.$ **6**

OR

A manufacturer has 600 litres of a 12% solution of a acid. How many litres of 30% acid solution must be added to it so that acid content in the resulting mixture will be more than 15% but less than 18%?

24. The second, third and fourth terms in the binomial expansion $(x+a)^n$ are 240, 720 and 1080, respectively. Find *x*, *a* and n. **6**

25.Find the sum of the following series up to n terms **:** $\frac{1^3}{1}+\frac{1^3+3^3}{1+3}+\frac{1^3+3^3+5^3}{1+3+5}+.....$

6

26.Evaluate :

(i) $\lim\limits_{x\to 0}\frac{\sin x-2\sin 3x+\sin 5x}{x}$ **2**

(ii) Find the derivative of $x^2\sin x$ with respect to x, from first principle. **4**