Sample Paper-03
Mathematics
Class – XI

Time allowed: 3 hours   **M. M: 100**
General Instructions:
(i) All questions are compulsory.
(ii) This question paper contains 29 questions.
(iii) Question 1- 4 in Section A are very short-answer type questions carrying 1 mark each.
(iv) Question 5-12 in Section B are short-answer type questions carrying 2 marks each.
(v) Question 13-23 in Section C are long-answer-I type questions carrying 4 marks each.
(vi) Question 24-29 in Section D are long-answer-II type questions carrying 6 marks each.

Section A

1. Find the domain of the function $f(x) = \dfrac{1}{\sqrt{2 - x^2}}$

2. If $A = \{ y = \sin x, 0 \le x < \dfrac{\pi}{4} \}\ and\ B = \{ y = \cos x, 0 \le x < \dfrac{\pi}{4} \}$ then what is $(A \cap B)$

3. What is the maximum value of a if $a = 1 - \sin x$

4. Name the locus of points (M), the sum of whose distance from two given points is a constant

Section B

5. Check whether the three points (2, 0), (5, 3), (2, 6) are collinear.

6. Write the condition so that the equation $ax^2 + ay^2 + bx + cy + d = 0$ represents a circle.

7. Solve $\cos 3x = -\dfrac{1}{2}$

8. Prove by mathematical induction that $1 + 2 + 3 + \ldots\ldots + n = \dfrac{n(n+1)}{2}$

9. Find the square root of $\sqrt{-8i}$

10. Solve the inequality $\dfrac{2x+5}{x-2} \ge 3$

11. Find the value of x if $^{12}C_x = {}^{12}C_{x+4}$

12. Three cars are there in a race. Car A is 3times as likely to win as car B. Car B is twice as likely to win as car C. What is the probability of winning each car.

Section C

13. If $f(x)$ is a function that contains 3 in its domain and range and satisfy the relation

$f(f(x)).(1 + f(x)) = -f(x)$ find f(3)

14. If $\tan A = \dfrac{1}{3}$ *and* $\tan B = \dfrac{1}{2}$ prove that $\sin 2(A+B) = 1$

15. Find two numbers such that their arithmetic mean is 15 and Geometric mean is 9 without using the identity $(a+b)^2 = (a-b)^2 + 4ab$

16. Let $f : R \to R$ be a function given by $f(x) = x^2 + 2$ find $f^{-1}(27)$

17. Find the domain and range of the function $f(x) = \dfrac{x-a}{a+1-x}$ where a is a positive integer.

18. Find the limit of $\lim\limits_{x \to 0} \dfrac{\sqrt{a+x} - \sqrt{a}}{x}$

19. Find the sign and value of the expression $\sin 75^0 + \cos 75^0$

20. In how many ways can 3 students from Class 12, 4 from class 11, 4 from class 10 and 2 from class 9 be seated in a row so that those of the same classes sit together. Also find the number of ways they can be arranged in at a round table

21. A circle represented by the equation $(x-a)^2 + (y-b)^2 = r^2$

This makes two complete revolutions along the positive direction of the x axis. Find the equation of the circle in the new position

22. Show that the equation $x^2 + 4y^2 + 4x + 16y + 16 = 0$ represents an ellipse.

23. Calculate the mean deviation about the mean from the following data

x_i	2	15	17	23	27
f_i	12	6	12	9	5

Section D

24. If the ratio of the roots of the equation $x^2 + px + q = 0$ is the same as $x^2 + p_1 x + q_1 = 0$ then prove that $p^2 q_1 = p_1^2 q$

25. Prove that $a.a^{\frac{1}{2}}.a^{\frac{1}{4}}.a^{\frac{1}{8}}.......\infty = a^2$

26. In a survey of 700 students in a medical college 200 went for regular entrance coaching, 295 attended only correspondence coaching, 115 attended both regular and correspondence coaching. Find how many got admission without any entrance coaching.