Sample Paper-02
Mathematics
Class – XI

Time allowed: 3 hours Maximum Marks: 100

General Instructions:

a) All questions are compulsory.
b) 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 comprises of 13 questions of four marks each and Section C comprises of 7 questions of six marks each.
c) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
d) Use of calculators is not permitted.

Section A

1. Identify a function $f(x)$ so that $f(x).f(y) = f(x+y)$
2. If $A = \{(x, y) : y = a^x, x \in R\}$ $and B = \{(x, y) : y = a^{-x}, x \in R\}$ then what is $(A \cap B)$
3. If R is a relation from a set A containing p elements to a set B containing q elements the find the number of subsets of $A \times B$
4. Check whether the given lines are parallel or perpendicular.

   $ax - by + c = 0$ and $\frac{ax}{2} - \frac{by}{2} + d = 0$
5. Find the area of the triangle whose vertices are (2,0),(5,3),(2,6)
6. Write the equation of a circle with center (0,0) and radius 5

Section B

7. Solve $\cos 3x = -\frac{1}{2}$
8. Prove by mathematical induction that $1 + 2 + 3 + \ldots\ldots\ldots + n = \frac{n(n+1)}{2}$
9. Find the square root of $\sqrt{-8i}$
10. Solve the inequality $\frac{2x+5}{x-2} \geq 3$
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.
13. If $f(x)$ is a function that contains 3 in its domain and range and satisfy the relation

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

14. If $\tan A = \frac{1}{3}$ *and* $\tan B = \frac{1}{2}$ 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 $f(x) = \frac{x-a}{a+1-x}$ where a is a positive integer.

18. Find the limit of $\lim_{x \to 0} \frac{\sqrt{a+x} - \sqrt{a}}{x}$

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

Section C

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

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.

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