Sample Paper-01
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. Find the number of subsets of a set A containing 10 elements
2. How many ways can you choose one or more students from 3 students?
3. In How many ways can one choose 3 cards from a pack of 52 cards in succession (1) with replacement (2) without replacement?
4. State the condition under which the product of two complex numbers is purely imaginary
5. In a circle of radius 1 unit what is the length of the arc that submits an angle of 2 radians at the centre.
6. Is $\cos\theta$ positive or negative if $\theta = 500 radians$

Section B

7. Prove by mathematical induction that $n(n+1)(2n+1)$ is divisible by 6 if n is a natural number
8. Solve $\cos 2x - 5\sin x - 3 = 0$
9. For what values of m the equation $m^2x^2 + 2(m+1)x + 4 = 0$ will have exactly one zero
10. Three numbers are in AP. Another 3 numbers are in GP. The sum of first term of the AP and the first term of the GP is 85, the sum of second term of AP and the second term of the GP is 76 and that of the 3rd term of AP and 3rd term of GP is 84. The sum of the AP is 126. Find each term of AP and GP
11. If $f(x) = 4^x$ find $f(x+1) - f(x)$ in terms of $f(x)$

12. If $f(x)=\log\frac{(1+x)}{(1-x)}$ Prove that $f\left(\frac{3x+x^3}{1+3x^2}\right)=3f(x)$ *when* $-1<x<1$

13. Find the value of $\sin 75 and \cos 75$

14. Prove that $\frac{sin3\theta}{\sin\theta}-\frac{\cos 3\theta}{\cos\theta}=2$

15. If the line $y=mx+1$ is a tangent to the ellipse $x^2+4y^2=1$ then find the value of m^2

16. Reduce the equation $3x-4y+20=0$ in to normal form

17. Solve the inequality $\frac{x+3}{x-7}\le 0$

18. Find $\lim_{x\to\infty}\frac{x^2-ax+4}{3x^2-bx+7}$

19. Find $\lim_{x\to 0}\frac{\tan x}{\sin 3x}$

Section C

20. Evaluate $x^3+x^2-4x+13$ when $x=1+i$ and when $x=1-i$

21. Prove that the roots of the equation $(x-\alpha)(x-\beta)=k^2$ is always real

22. If the roots of the equation $lx^2+nx+n=0$ are in the ratio $p:q$ then prove that

$$\frac{\sqrt{p}}{\sqrt{q}}+\frac{\sqrt{q}}{\sqrt{p}}+\frac{\sqrt{n}}{\sqrt{l}}=0$$

23. Find $\lim_{x\to\pi}(\pi-x)\tan\frac{x}{2}$

24. If a, b, c are 3 consecutive integers prove that $(a-i)(a+i)(c+i)(c-i)=b^4+1$

25. Prove that $\frac{(1+i)^n}{(1-i)^{n-2}}=2i^{n-1}$

26. Determine the coordinates of a point which is equidistant from the point $(1,2) and (3,4)$ and the shortest distance from the line joining the points $(1,2) and (3,4)$ to the required point is $\sqrt{2}$