
Sample Paper-04
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.
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Section A

1. Compute $(1+2i)i - \frac{3+2i}{1-i}$
2. Write the domain and range of the function $\cos^{-1} x$
3. Find the sign of y if $y = \sin(\cos^{-1} x)$
4. Find $\sin^{-1}\left(\sin\left(\frac{6\pi}{7}\right)\right)$
5. Write the coordinates of the point of intersections of the parabola represented by $y^2 = 4ax$ and its latus rectum
6. Find x and y if $(x+7, 8) = (10, x+y)$

Section B

7. Solve $\sin^2 x + \sin^2 2x = 1$
8. Find the value of $i^{30} + i^{40} + i^{60}$
9. Determine whether the points $(0,0)$ and $(5,5)$ lie on different sides of the straight line $x + y - 8 = 0$ or on the same side of the straight line.
10. Prove that $\tan^{-1} x + \cot^{-1} x = \frac{\pi}{2}$
11. Prove by mathematical induction that $11^{n+2} + 12^{2n+1}$ is divisible by 133 for all positive integer values of n

12. A, B, C are 3 sets and U is the universal set such that

$$n(U) = 800, n(A) = 200, n(B) = 300, n(A \cap B) = 100 \text{ Find } n(A' \cap B')$$

13. If α, β are the roots of the equation $x^2 - bx + c = 0$ find the value of $\alpha^2 + \beta^2$

14. If P be the sum of the odd terms and Q the sum of the even terms in the expansion of $(x + a)^n$,

$$\text{prove that } P^2 - Q^2 = (x^2 - a^2)^n$$

15. Solve the inequality $\frac{x^2 - 3x + 6}{3 + 4x} < 0$

16. Prove that $\cot(A+15) - \tan(A-15) = \frac{4 \cos 2A}{1 + 2 \sin 2A}$

17. Find the domain of the function $f(x) = \sqrt{4 - x^2}$

18. Evaluate $\frac{1}{2 + \cos \theta + \sin \theta}$ if $\tan \frac{\theta}{2} = 2$

19. Find the limit $\lim_{x \rightarrow 0} \frac{\sin 5x}{x + x^3}$

Section C

20. Differentiate $\log_{10} x$ with respect to x

21. How many 6 digits numbers can be formed with the digits 1, 2, 3, 4, 5, 6, 7 if the 10th, unit's places are always even and repetition is not allowed.

22. Shift the origin to a suitable point so that the equation $x^2 + y^2 - 4x + 6y = 36$ representing a circle is

transformed in to an equation of a circle with centre at origin in the new coordinate axes.

23. The mean and variance of 7 observations are 8 and 19 respectively. If 5 of the observations are 2, 4, 12, 14, 11. Find the remaining observations.

24. Prove that $\frac{1}{\log_a b}, \frac{1}{\log_{2a} b}, \frac{1}{\log_{4a} b}$ form an AP

25. On the average one person dies out of every 10 accidents find the probability that at least 4 will be safe out of 5 accidents.

26. In the expansion $(1 + x)^{40}$, the coefficients of T_{2r+1} and T_{r+2} are equal, find r