

Sample Paper-04
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 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.

Section B

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

Section C

- 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 $(x+a)^n$, 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 $\lim_{x \rightarrow 0} \frac{\sin 5x}{x + x^3}$
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.

Section D

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