

Sample Paper-02
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. Solve for x if $|x| + x = 2 + i$
2. Write the sum of first n odd numbers
3. Write the n^{th} term if the sum of n terms of an AP is $2n^2 + 3n$
4. If $a < b$ write the length of latus rectum of an ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

Section B

5. If $f(x) = 5$ for all real numbers of x find $f(x+5)$
6. What is the maximum number of objects you can weigh if you have four distinct weights.
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 $m^2 x^2 + 2(m+1)x + 4 = 0$ 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 $-1 < x < 1$

Section C

13. Find the value of $\sin 75$ and $\cos 75$
14. Prove that $\frac{\sin 3\theta}{\sin \theta} - \frac{\cos 3\theta}{\cos \theta} = 2$

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 $\frac{x+3}{x-7} \leq 0$
18. Find $\lim_{x \rightarrow \infty} \frac{x^2 - ax + 4}{3x^2 - bx + 7}$
19. Find $\lim_{x \rightarrow 0} \frac{\tan x}{\sin 3x}$
20. Differentiate $\sin x$ from the first principle w.r.t. x
21. Find the sum of n terms of the series $12 + 16 + 23 + 33 + 46 \dots$
22. Find the equation of a circle whose diameter is the line joining the points (x_1, y_1) and (x_2, y_2)
23. Calculate the mean deviation about the mean from the following data
- | | | | | | | |
|-------|----|---|---|----|----|----|
| x_i | 5 | 7 | 9 | 10 | 12 | 15 |
| f_i | 14 | 6 | 2 | 2 | 2 | 4 |

Section D

24. How many numbers can be formed with the digits $1, 2, 3, 4, 3, 2, 1$ so that odd digits are in odd places and even digits are in even places.
25. Two engineers go for an interview for two vacancies in the same grade. The probability of engineer 1 (E1) getting selected is $\frac{1}{3}$ and that of engineer 2 (E2) is $\frac{1}{5}$. Find the probability that only one of them will be selected.
26. How many numbers are there between 1 and 1000 (both included) that are not divisible by 2, 3, and 5?