

Class – XI
Subject - Mathematics

Max Time: 3 hrs.

Max Marks: 100

General

Instructions:

- i. All questions are compulsory.
- ii. The question paper consists of 29 questions divided in three sections A, B and C. Section A comprises of 10 questions of 1 mark each, Section B comprises of 12 questions of 4 marks each and Section C comprises of 7 questions of 6 marks each.
- iii. All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question.
- iv. There is no over all choice. However, internal choice has been provided in 4 questions of four marks each and 3 questions of six marks each. You have to attempt only one of the alternatives in all such questions.
- v. Use of calculator is not permitted

SECTION : A

Q.1. Write the set $A = \{ x \mid 4x-5 < 29, x \in \mathbb{N} \}$ in the Roster form ?

Q.2. Find the value of $\sin 31 \pi / 3$?

Q.3. Find the multiplicative inverse of $\sqrt{5} + 3i$?

Q.4. Find the equation of the line parallel to the $3x-4y+2 = 0$ and passing through the point $(-2,3)$?

Q.5. Three coins are tossed once. Find the probability of getting exactly two tails?

Q.6. If $p(A) = .54$, $p(B) = .69$ & $p(A \cap B) = .35$ find $p(A' \cap B')$?

Q.7. Find r if $5 \times ({}^4 P_r) = 6 \times ({}^5 P_{r-1})$.

Q.8. Find the middle terms in the expansion of $(x/3 + 9y)^{10}$.

Q.9. Find the value of x for which the points $(x,-1)$ $(2,1)$ and $(4,5)$ are collinear.

Q.10. In a single throw of two dice find the probability of getting a total of 8 on the face of dice.

SECTION : B

Q.11. If $U = \{ 1,2,3,4,5,6,7,8,9\}$, $A = \{2,4,6,8\}$, $B = \{2,3,5,7\}$

Verify that

(i) $(A \cup B)' = A' \cap B'$

(ii) $(A \cap B)' = A' \cup B'$

Q.12. Let $A = \{1,2,3,\dots, 14\}$ Define a relation R from A to A by $R = \{(x,y) : 3x - y = 0, \text{ where } x,y \in A\}$. Write down its domain, co domain and range.

Or

Let f and g are two real valued functions defined respectively by $f(x) = 2x+1$, $g(x) = x^2 - 5$, find $(f+g)x$, $(f-g)x$, $(fg)x$ and $(f/g)x$.

Q.13. Prove that $\cos(\pi/4 + x) + \cos(\pi/4 - x) = 2 \cos x$.

Or

Find the general solution for the equation

$$\sec^2 2x = 1 - \tan 2x.$$

Q.14. A committee of 7 has to be formed from 9 boys and 4 girls. In how many ways can this be done when the committee consists of (a) exactly 3 girls (b) at least 3 girls (c) utmost 3 girls.

Q.15. Find the equation of the set of points P such that its distances from the points A (3,4,-5) and B (-2,1,4) are equal.

Q.16. By using the principal of mathematical induction for all $n \in \mathbb{N}$.
 $1^2 + 3^2 + 5^2 + \dots + (2n-1)^2 = n(n-1)(2n+1)/3$.

Q.17. If $(x+iy)^3 = u + iv$, then show that
 $u/x + v/y = 4(x^2 - y^2)$

Q.18. In how many ways can the letter of the word **PERMUTATIONS** be arranged if the -

- (i) Words start with P and end with S.
- (ii) Vowels are all together.
- (iii) There are always 4 letter between P and S.

Q.19. Write the contra- positive and converse of the following statements .

- (i) If x is a prime number, then x is odd.
- (ii) If a triangle is equilateral , it is isosceles.

Q.20. Find the derivative of following function :

- (i) $y = x / \sin^n x$
- (ii) $y = (ax^2 + \sin x) (p+q\cos x)$

Or

Find the derivative of $f(x) = x \sin x$ from the first principle.

Q.21. Find the equation of the circle passing through the points (4,1) and (6,5) and whose centre is on the line $4x+y= 16$.

Q.22. Prove that the coefficient of x^n in the expansion of $(1+x)^{2n}$ is twice the coefficient of x^n in the expansion of $(1+x)^{2n-1}$.

Or

Evaluate : $(a^2 + \sqrt{a^2 - 1})^4 + (a^2 - \sqrt{a^2 - 1})^4$

SECTION : C

Q.23. In a survey of 60 people it was found that 25 people read newspaper H, 26 read newspaper T, 26 read newspaper I, 9 read both H and I, 11 read both T and I, 3 read all three newspaper. Find

- (1) The number of people who read at least one of the newspaper.
- (2) The number of people who read exactly one news paper.
- (3) The number of people who do not read any newspaper.

Q.24.. Find the coordinate of the foci, the vertices and lenth of major axis, the eccentricity and the length of the latus rectum of the ellipse:

$$\frac{X^2}{100} + \frac{Y^2}{400} = 1$$

Q.25. Prove that:

$$\cos^2 x + \cos^2 (x + \pi/3) + \cos^2 (x - \pi/3) = 3/2$$

Or

$$\frac{\sin 8A \cdot \cos A - \cos 3A \cdot \sin 6A}{\cos 2A \cdot \cos A - \sin A \cdot \sin 4A} = \tan 2A$$

Q.26. Find the sum of n terms of the series $3x^1 + 5x^2 + 7x^3 + \dots$

OR

If a and b are roots $x^2 - 3x + p = 0$ and c, d are that roots of $x^2 - 12x + q = 0$, where a, b, c, d form G.P. Prove that $(q+p) : (q-p) = 17:15$

Q.27. Graphically solve the following system of linear equations,

$$3x + y \leq 66,000, \quad x + y \leq 45,000,$$

$$x \leq 20,000, \quad y \leq 40,000 \text{ and } x \geq 0, y \geq 0$$

Q.28. Find the image of the point(3,8) w.r.t the line $x + 3y = 7$ assuming, the line to be a plane mirror.

Q.29. Calculate Mean, Variance and Standard deviation for the following distribution.

CLASSES	20-30	40-50	50-60	60-70	70-80	80-90	90-100
FREQUENCY	3	7	12	15	8	3	2