



Instructions: Do not write or mark anything on the question paper.

- The question paper has five parts namely A, B, C, D and E. Answer all the parts.
- Section A has 10 MCQ's, 5 fill in the blanks and 5 very short answer questions of 1 mark each.
- The sub question I and II of Part A should be answered continuously at one or two pages. Only first answer is considered for the marks in sub question I and II of Part A.
- Use the graph sheet for question on linear inequality in Part D.

PART A

I. Answer ALL the Multiple-choice questions:

1x10=10

- If $A = \{\text{positive prime numbers}\}$, $B = \{\text{even numbers}\}$ then $n(A \cap B) =$
(A)0 (B)1 (C)2 (D)4
- If the set A has n elements then the number of relations on A is
(A)n (B) n^2 (C) 2^n (D) 2^{n^2}
- The value of $\tan 1^\circ \cdot \tan 2^\circ \cdot \tan 3^\circ \dots \dots \tan 89^\circ$ is
(A)0 (B)1 (C)-1 (D)2
- The value of $i^{24} + \left(\frac{1}{i}\right)^{26}$ is
(A)1 (B)i (C)-i (D)0
- The value of $\frac{7!}{4!}$ is equal to
(A)210 (B)215 (C)201 (D)220
- Which term of the series $3 + 8 + 13 + 18 + \dots \dots \dots$ is 498
(A)95th (B)100th (C)102th (D)101th
- The slope of the line is $3x - 4y + 10 = 0$ is
(A) $\frac{3}{4}$ (B) $\frac{-3}{4}$ (C) $\frac{-4}{3}$ (D) $\frac{4}{3}$
- Evaluate $\lim_{x \rightarrow \pi} \frac{\sin(\pi-x)}{\pi(\pi-x)} =$
(A)1 (B)0 (C) $\frac{1}{\pi}$ (D) π
- The negation of the statement "all triangles are not equilateral triangle" is
(A)All triangles are equilateral triangle
(B)Some triangles are not equilateral triangle.
(C) Some triangles are not equilateral triangle.
(D)All triangles are isosceles triangle.
- If a coin is tossed twice, then the probability that atleast one tail occur is
(A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{3}{4}$ (D)1

II. Fill in the blanks by choosing the appropriate answer from those given in the bracket:

1x5=5

(1, 4, 8, $\frac{4}{5}$, 26,)

- If number of subsets of a set A is 16 then the number of elements in A is _____.
- The number of terms in the expansion of $(x + y)^{51} - (x - y)^{51}$ is _____.
- The eccentricity of the ellipse $\frac{x^2}{25} + \frac{y^2}{9} = 1$ is _____.
- The perpendicular distance of the point P (6,7,8) from xy plane is _____.
- If the function f(x) defined by $f(x) = \frac{x^{100}}{100} + \frac{x^{99}}{99} + \dots + \frac{x^2}{2} + x + 1$, then $f'(0) =$ _____.

III. Answer all the following questions:**1x5=5**

16. Find the value of $\tan\left(\frac{19\pi}{3}\right)$.
17. If x is any real number then solve $3(x - 1) \leq 2(x - 3)$.
18. If ${}^nC_8 = {}^nC_2$, find nC_2 .
19. Reduce $6x + 3y - 5 = 0$ into slope intercept form.
20. Find the median of 8, 1, 3, 5, 22, 17, 12, 13.

PART B**IV. Answer any Nine questions:****2x9=18**

21. Let $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$, $A = \{2, 4, 6, 8\}$ and $B = \{3, 4, 5, 6\}$. Find $(A - B)^c$.
22. Are the pair of sets equal? If $A = \{2, 3\}$, $B = \{x: x \text{ is solution of } x^2 + 5x + 6 = 0\}$.
23. If $A = \{1, 2\}$ and $B = \{3, 4\}$. Write $A \times B$. How many subsets will $A \times B$ have?
24. In a circle of diameter 40 cm, the length of chord is 20 cm. Find the length of minor arc of the chord.
25. Prove that $\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$.
26. Find the multiplicative inverse of $\sqrt{5} + 3i$.
27. Ravi obtained 70 and 75 marks in first two-unit test. Find the minimum marks he should get in the third test to have an average of at least 60 marks.
28. Write the converse and contrapositive of the statement: "If a number n is even, then n^2 is even".
29. Find the equation of the line parallel to the line $3x - 4y + 2 = 0$ passing through the point $(-2, 3)$.
30. Write the equation of the line for which $\tan \theta = \frac{1}{2}$, where θ is the inclination of the line and x intercept is 4.
31. Show that $(-1, 2, 1), (1, -2, 5), (4, -7, 8)$ and $(2, -3, 4)$ are the vertices of a parallelogram.
32. Evaluate $\lim_{x \rightarrow 2} \left(\frac{3x^2 - x - 10}{x^2 - 4} \right)$.
33. The mean and variance of height of class XI students are 162.6 cm and 127.69 cm^2 respectively. Find the co-efficient of variation.
34. A die is thrown, find the probability of following events: (i) A prime number will appear (ii) a number greater than or equal to 3 will appear.

PART C**V. Answer any Nine questions:****3x9=27**

35. In a survey of 400 students in a school, 100 were listed as taking apple juice, 150 as taking orange juice and 75 were listed as taking both apple as well as orange juice. Find how many students were taking neither apple juice nor orange juice.
36. If $A = \{1, 2, 3, 5\}$ and $B = \{4, 6, 9\}$. Define a relation R from A to B by $R = \{(x, y): \text{the difference between } x \text{ and } y \text{ is odd}; x \in A, y \in B\}$. Write down the domain, codomain and range of R .
37. Find the general solution of $\sin x + \sin 3x + \sin 5x = 0$.
38. Express $\sqrt{3} + i$ into polar form.
39. Solve the equation $x^2 + \frac{x}{\sqrt{2}} + 1 = 0$.
40. How many words with or without meaning can be made from the letters of the word MONDAY assuming that no letter is repeated, if (i) 4 letters are used at a time. (ii) All letters are used at a time (iii) All letters are used but first letter is a vowel.
41. Find the co-efficient of x^5 in $(x+3)^8$.
42. Insert five numbers between 8 and 26 such that the resulting sequence is an AP.

43. The sum of first three terms of a GP is 16 and the sum of the next three terms is 128. Determine the first term, the common ratio and the sum to n terms of the GP.
44. Find the equation of parabola with vertex at the origin, axis along x- axis and passing through the point (2,3).
45. Find the derivative of $\cos x$ from first principles.
46. Verify by the method of contradiction that $\sqrt{5}$ is irrational.
47. Consider the experiment of rolling a die. Let A be the event "getting a prime number". B be the event "getting an odd number". Write the sets representing the events (i) A or B (ii) A and B (iii) A but not B.
48. Find the probability that when a hand of 7 cards is drawn from a well shuffled deck of 52 cards, it contains (i) all kings (ii) 3 kings (iii) atleast 3 kings.

PART D

VI. Answer any Five questions:

5x5=25

49. Define Greatest integer function. Draw the graph of the function. Write the Domain and range of f.
50. Prove that $\frac{\cos 4x + \cos 3x + \cos 2x}{\sin 4x + \sin 3x + \sin 2x} = \cot 3x$.
51. Prove by mathematical induction that $1^3 + 2^3 + 3^3 + 4^3 + \dots + n^3 = \frac{n^2(n+1)^2}{4} \quad \forall n \in \mathbb{N}$.
52. Solve the following system of inequalities graphically:
 $3x + 4y \leq 60, x + 3y \leq 30, x \geq 0, y \geq 0$.
53. A group consists of 4 girls and 7 boys. In how many ways can a team of 5 members be selected if the team has (i) no girl (ii) atleast one boy and one girl (iii) atleast 3 girls.
54. State and Prove Binomial Theorem for any positive integer n.
55. Derive the formula to find the angle between two straight lines with slopes m_1 and m_2 . Hence find the slope of the line which makes an angle $\frac{\pi}{4}$ with the line $x - 2y + 5 = 0$.
56. Derive the formula for the distance between two points $P(x_1, y_1, z_1)$ and $Q(x_2, y_2, z_2)$.
57. Prove Geometrically that $\lim_{x \rightarrow 0} \frac{\sin x}{x} = 1$, x is in radians.
58. Find variance and standard deviation for the following data.

Class	78-80	80-82	82-84	84-86	86-88	88-90
Frequencies	3	15	26	23	9	4

PART E

VII. Answer the following questions:

10x1=10

59. Prove geometrically that $\cos(x + y) = \cos x \cdot \cos y - \sin x \cdot \sin y$ and hence prove that $\cos 2x = \cos^2 x - \sin^2 x$. (6)

OR

Define Hyperbola as a set of points. Derive its equation in the form $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$. (6)

60. Find the sum to n terms of the series $\frac{1}{1 \times 2} + \frac{1}{2 \times 3} + \frac{1}{3 \times 4} + \dots$ (4)

OR

Find the derivative of $y = \frac{x + \cos x}{\tan x}$. (4)
