M.M. 80

Time: 3hrs.

General Instructions:
1. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer type questions of 2 marks each.
4. Section C has 6 Short Answer type questions of 3 marks each.
5. Section D has 4 Long Answer type questions of 5 marks each.
6. Section E has 3 case based studies of 4 marks each.

Section - A

1. Let A and B be two sets in the same universal set, than $A - B =$

    a) $A \cap B$ b) $A' \cap B$ c) $A \cap B'$ d) none of these

2. The number of subsets of a set containing n element is

    a) n b) $2^n - 1$ c) n^2 d) 2^n

3. The set – builder form of $(-7, 0)$ is

    a) $\{x : x \in R, -7 < x \le 0\}$ b) $\{x : x \in R, -7 \le x \le 0\}$

    c) $\{x : x \in R, -7 \le x < 9\}$ d) $\{x : x \in R, -7 < x < 0\}$

4. Number of all possible subsets of $A = \{a\}$

    a) 0   b) 1   c) 2   d) 3

5. The range of the relation R defined by $R = \{(x, x + 5) : x \in \{0, 1, 2, 3, 4, 5\}$ is

    a) $\{5, 6, 7, 8\}$ b) $\{5, 6, 7, 8, 9, 10\}$

    c) $\{5, 6, 7, 8, 10\}$ d) $\{5, 7, 8, 9, 10\}$

6. The total number of relations from A into A, if $A = \{2, 3\}$

    a) 4   b) 8   c) 16   d) 32

7. If $f(x) = 3x^4 - 5x^2 + 9$, then $f(-1)$ is

    a) 9   b) 7   c) 5   d) 3

8. Evaluate i^{457}

    a) 1   b) i c) $-i$ d) -1

A - 1

9. Compute : $\sqrt{-25} + 3\sqrt{-4} + 2\sqrt{-9}$

   a) $10\,i$ b) $11\,i$ c) $13\,i$ d) $17\,i$

10. Find $|1 + i|$

   a) 1   b) 3   c) 2   d) -2

11. The conjugate of $-3 + 2i$ is

   a) $3 - 2i$ b) $-3 - 2i$ c) $3 + 2i$ d) -3

12. If $-x < -7$, then

   a) $-x \leq 7$ b) $-x \leq -7$ c) $-x > -7$ d) $-x \geq -7$

13. If $-3x + 12 < 0$, then

   a) $x < 4$ b) $x < -4$ c) $x > 4$ d) $x > -4$

14. LCM of $(6i,\ 7i,\ 8i)$ is
    a) $6i$ b) $7i$ c) $8i$ d) $10i$

15. The number of ways in which five children stand in the queue are?

   a) 120   b) 130   c) 140   d) 150

16. If $c\,(n, 12) = c\,(n, 5)$, then value of n is

   a) 15   b) 16   c) 17   d) 18

17. The number of chords drawn through 21 points on circle are

   a) 21   b) 11   c) 210   d) 20

18. The slope of line, passing though two points $A = (3, -2)$ and $B\ (7, -2)$

   a) 4   b) 0   c) 1   d) not defined

19. If two lines of slope m_1 and m_2 are perpendicular then
    a) $m_1 + m_2 = 0$ b) $m_1 \times m_2 = 1$ c) $m_1 \times m_2 = -1$ d) $m_1 = -m_2$

20. The median of the following data is 3, 9, 3, 5, 12, 10, 18, 4, 7, 19, 21
    a) 5   b) 6   c) 9   d) 10

A - 2

Section – B

21. Write the following sets in roster form

    a) $A = \{x : x \text{ is a two} - \text{digit natural number such that the sum of its digits is } 8\}$

    b) $B = \{x : x \text{ is an integer and} - 3 \le x < 7\}$

22. Find the domain and range of $f(x) = |x|$, also draw the graph.

23. Express $\dfrac{5+\sqrt{2}i}{1-\sqrt{2}i}$ in the form $a + i\,b$

24. Solve $5x - 3 < 7$, when
    a) x is an integer   b) x is a real number

25. Expand using Binomial theorem

    $$\left(\frac{x}{3}+\frac{1}{x}\right)^5$$

Section – C

26. If $A = \{3, 5, 7, 9, 11\}$, $B = \{7, 9, 11, 13\}$, $C = \{11, 13, 15\}$, $D = \{15, 17\}$, find

    a) $A \cap C \cap D$ b) $A \cap (B \cup D)$ c) $A \cap (B \cup C)$

27. Find the domain and range of $\sqrt{9 - x^2}$

28. Find the real numbers x and y if $(x - iy)(3 + 5i)$ is the conjugate of $-6 - 24i$

29. Solve the inequalities and represent the solution on the number line

    $3x - 7 > 2(x - 6)$, $6 - x > 11 - 2x$

30. Find n if $P = (n - 1, 3) : P(n, 4) = 1 : 9$

31. Find which is larger $(1.1)^{10000}$ or $/1000$, using binomial theorem

Section – D

32. a) $\dfrac{(a+i)^2}{(2a-i)} = p + i\,q$, show that $p^2 + q^2 = \dfrac{(a^2+1)^2}{4a^2+1}$ (3)

    b) Find the multiplicative inverse of $3 + 2i$

                                         (2)

33. a) Find the number of arrangements of the letters of word INDEPENDENCE   (1)
    b) In how many of these arrangements.
    c) Do the words starts with P.   (1)
    d) Do all the vowels always occur together   (1)
    e) Do all the vowels never occur together   (1)
                                                          (1)

A-3

34. a) Find the angle between the $x - axis$ and the line joining the points $(3, -1)$ and $(4, -2)$ (2)

   b) Find the equation of the line passing through $(-3, 5)$ and perpendicular to the line through the points $(2, 5)$ and $(-3, 6)$ (3)

35. Calculate mean, variance and standard deviation for the following distribution

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

Section – E

Case Study Questions

36. Two non – empty set A and B are given by $A = \{x : x \text{ is a letter in MATHEMATICS}\}$ $B = \{x : x \text{ is a letter in STATISTICS}\}$.
   Based on the above information, answer the following questions :

   1. Write set A and B in roster form. (1)
   2. Find AUB (1)
   3. Find $A \cap B$ and number of subsets of A and B (2)

37. If $A = \{1, 2, 3, 5\}$, $B = \{4, 6, 9\}$ and a relation R from A to B is defined by $R = \{(x, y): \text{the difference between } x \text{ and } y \text{ is odd}, x \in A, y \in B\}$. Then

   1. Write R in the roster form (1)
   2. Write domain and range of R (1)
   3. Represent R by an arrow diagram (2)

38. The vertices of ΔPQR and P (2, 1), Q (-2, 3) and R (4, 5) from above information.
   1. Find slope of line PR (1)
   2. Find slope of line PQ (1)
   3. Find the equation of the median through vertex R. (2)

A – 4

BUDHA DAL PUBLIC SCHOOL PATIALA
FIRST TERM EXAMINATION (21 September 2023)
Class – XI
Paper- Mathematics (Set-B)

Time: 3hrs.

M.M. 80

General Instructions:
1. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer type questions of 2 marks each.
4. Section C has 6 Short Answer type questions of 3 marks each.
5. Section D has 4 Long Answer type questions of 5 marks each.
6. Section E has 3 case based studies of 4 marks each.

Section - A

1. For any two set A and B, $A \cap (A \cup B) =$

    a) A b) B c) $\emptyset$ d) none of these

2. If $A = \{1, 3, 5, 8\}$ and $B = \{2, 4\}$, then

    a) $4 \in A$ b) $\{4\} \subset A$ c) $B \subsetneq A$ d) none of these

3. Let $A = \{x : x \in R, x > 4\}$ and $B = \{x \in R : x < 5\}$, then $A \cap B =$

    a) $(4, 5]$ b) $(4, 5)$ c) $[4, 5)$ d) $[4, 5]$

4. Number of all possible subsets of $A = \{a\}$

    a) 0   b) 1   c) 2   d) 3

5. The range of the relation R defined by $R = \{(x, x + 5): x \in \{0, 1, 2, 3, 4, 5\}$ is

    a) $\{5, 6, 7, 8\}$ b) $\{5, 6, 7, 8, 9, 10\}$

    c) $\{5, 6, 7, 8, 10\}$ d) $\{6, 7, 8, 9, 10\}$

6. If $n(A) = 3, n(B) = 4$, then $n(A \times B)$ is

    a) 3   b) 4   c) 12   d) 27

7. If $(x + 1, y - 2) = (3, 1)$, the values of x and y are

    a) $(1, 2)$ b) $(2, 3)$ c) $(3, 4)$ d) $(4, 5)$

8. Evaluate i^{528}

    a) 0   b) 1   c) 2   d) 3

B-1

9. Compute : $\sqrt{-25} + 3\sqrt{-4} + 2\sqrt{-9}$

    a) $10\,i$ b) $11\,i$ c) $13\,i$ d) $17\,i$

10. Find $|3 + 4i|$

    a) 3   b) 4   c) 5   d) -5

11. The conjugate of $4 - 3i$ is

    a) $-4 + 3i$ b) $-4 - 3i$ c) $4 + 3i$ d) $-3i$

12. If $x > 4$, then

    a) $-x < 4$ b) $-x < -4$ c) $x \geq -4$ d) $x \leq -4$

13. The solution set of $4x - 12 \geq 0$, is

    a) $(3, \infty)$ b) $(-\infty, 3)$ c) $[3, \infty)$ d) $(-\infty, 3]$

14. The number of ways to arrange the letters of the word CHEESE are

    a) 120   b) 240   c) 720   d) 6

15. The number of ways in which five children stand in the queue are?

    a) 120   b) 130   c) 140   d) 150

16. The number of chords drawn through 21 points on a circle are :

    a) 21   b) 11   c) 210   d) 20

17. The slope of line passing through two points $A(3, -2)$ and $B\ (7, -2)$

    a) 4   b) 0   c) not defined   d) 1

18. If two lines with slopes m_1 and m_2 are parallel to each other, then

    a) $m_1 = -m_2$ b) $m_1 = m_2$ c) $m_1 \times m_2 = 1$ d) $m_1 = m_2 = 0$

19. The median of the following data is 3, 9, 5, 3, 12, 10, 18, 4, 7, 19, 21
    a) 5   b) 6   c) 9   d) 10

20. If $c\ (n, 12) = c\ (n, 5)$, then value of n is

    a) 15   b) 16   c) 17   d) 18

21. Write the following sets in the set-builder form

    a) $A = \{2, 4, 8, 16, 32\}$

    b) $B = \{1, 4, 9 \ldots \ldots 100\}$

22. If $A = \{-1, 1\}$, find $A \times A \times A$

23. Express $\dfrac{3-2i}{1+2i}$ in the standard form $a + i\,b$

24. Solve $3x + 8 > 2$, when

    a) x is an integer   b) x is a real number

25. Expand using Binomial theorem

    $\left(\dfrac{2}{x} - \dfrac{x}{2}\right)^5$

Section – C

26. Find the domain and range of $\sqrt{25 - x^2}$

27. If $(x + iy)^3 = u + iv$, then show that $\dfrac{u}{x} + \dfrac{v}{y} = 4\,(x^2 - y^2)$

28. Solve the inequalities and represent the solution on the number line

    $2\,(x - 1) < x + 5, \; 3\,(x + 2) > 2 - x$

29. Find r, if $5\,P\,(4, r) = 6\,P\,(5, r - 1)$

30. Using binomial theorem, which is larger $(1.01)^{1000000}$ or $10,000$

31. Find the mean deviation about the mean for the following data :

x	2	5	6	8	10	12
y	2	8	10	7	8	5

Section – D

32. a) If $a + ib = \dfrac{(x+i)^2}{(2x^2+1)}$, prove that $a^2 + b^2 = \dfrac{(x^2+1)^2}{(2x^2+1)^2}$ (3)

    b) Find the multiplicative inverse of $\sqrt{5} + 3i$ (2)

B-3

33. a) What is the number of ways of choosing 4 cards from a pack of 52 playing cards? (1)
    b) In how many of those?
       i) Four cards are of same suit. (1)
       ii) Four cards belong to four different suits. (1½)
       iii) Two are red cards and two are black cards. (1½)

34. a) Reduce $3x + 2y - 12 = 0$ into intercept form and find their intercepts. (2)

    b) Find the equation of the line passing through $(-3, 5)$ and parallel to the line joining the points $(2, 5)$ and $(-3, 6)$ (3)

35. Find mean, variance and standard deviation for the following distribution

Class	0-10	10-20	20-30	30-40	40-50
Frequency	5	8	15	16	6

Section – E

Case Study Questions

36. Two non – empty set A and B are given by
    $A = \{x : x \text{ is a letter in the word } FOLLOW\}$
    $B = \{x : x \text{ is a letter in the word } WOLF\}$.
    Based on the above information, answer the following questions :

    1. Write set A and B in roster form. (1)
    2. Are the following pair of sets equal. (1)
    3. Find $A \cap B$ and number of subsets of set A. (2)

37. If $A = \{1, 2, 3, 4, 5, 6\}$. Define a relation R from A to A by
    $R = \{(x, y): yx + 1\}$, then

    1. Write relation R in the roster form (1)
    2. Write domain and range of R (1)
    3. Represent R by an arrow diagram (2)

38. The vertices of $\triangle ABC$ are A (2, 3), B (4, -1) and C (1, 2) from above information.

    1. Find the slope of line AB (1)
    2. Find the slope of line BC (1)
    3. Find the angle between the lines AB and BC. (2)

B-4