



B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL



PRE MID TERM (2026-27) APPLIED MATHEMATICS (241) SET-B

Class: XI (041)

Duration: 1 Hr

Date: 23.07.26

Max. Marks: 25

Admission No: _____

Roll No.: ____

GENERAL INSTRUCTIONS

- (i) All questions are compulsory.
- (ii) Marks are indicated against each question.
- (iii) For MCQ and Assertion-Reason, write ONLY the letter of the correct option.
- (iv) Use of set notation is mandatory wherever applicable.
- (v) Venn diagrams may be drawn for conceptual clarity but are not compulsory unless asked.

SECTION A | Multiple Choice Questions (1 mark each)

1. If $A = \{5^n - 4n - 1 : n \in \mathbb{N}\}$ and $\{16(n - 1) : n \in \mathbb{N}\}$ 1
a) $A \subseteq B$ b) $B \subseteq A$ c) $A = B$ d) $A \cap B = \emptyset$
2. If set A has m elements and set B has n elements, and they share exactly k elements in common, then the number of elements in the set $(A \times B) \cap (A \times A)$ is : 1
(a) m^2 (b) $m.n$ (c) $m.k$ (d) $n.k$
3. For sets A and B defined over universal set U, which of the following is ALWAYS false? 1
(a) $A \cap A' = \text{empty set}$ (b) $A \cup A' = U$
(c) $(A')' = A$ (d) $A \cap B' = A \cup B'$
4. A relation R is defined from $A = \{2, 3, 4, 6\}$ to $B = \{6, 8, 12, 14\}$ by : xRy such that x is relatively prime to y. Then the domain of R is: 1
(a) $\{2, 3, 4, 6\}$ (b) $\{3\}$ (c) $\{6, 8, 12, 14\}$ (d) $\emptyset$

5. If $n(U) = 150$, $n(A) = 60$, $n(B) = 45$ and $n(A \cup B) = 85$, then $n(A' \cap B')$ equals: 1
- (a) 5 (b) 25 (c) 35 (d) 60

Directions: Read both statements carefully and choose the correct option.

- (a) Both A and R are true and R is the correct explanation of A.
 (b) Both A and R are true but R is NOT the correct explanation of A.
 (c) A is true but R is false.
 (d) A is false but R is true.

6. Assertion (A): $R = \{(1,2), (1,3), (1,4)\}$ is a relation on the set $\{1,2,3\}$ 1
 Reason (R): For two sets A and B, any subset of $A \times B$ is a relation from A to B.

SECTION B | Short Answer (2 marks)

7. Find a linear relation between the components of the ordered pair of the relation $R = \{(0,2), (-1,5), (2,4), \dots\}$. 2
8. Two sets $A = \{x; x = 3n - 1, n \text{ is a whole number}, n < 4\}$, $B = \{2,5,8\}$ 2
 1 Prove or disprove that $A=B$ using the definition of equal sets.
 2 State the number of proper subsets of A.

SECTION C | Short Answer (3 marks)

9. Three sets A, B and C satisfy the following: 3
 $A = \{1, 2, 3, 4, 5, 6\}$, $B = \{2, 4, 6, 8\}$, $C = \{1, 3, 5, 7\}$
 (i) Find $(A \cap B) \cup (A \cap C)$.
 (ii) Verify the distributive law using these sets.
 (iii) Comment on whether A and C are disjoint.
10. Draw appropriate Venn diagram for the following : 3
 i) $(A \cap B)'$ ii) $A' \cap B'$ iii) $(A \cup B)'$

SECTION D | Long Answer (5 marks)

11. A survey of university students shows that 8% like streaming service S1 and 65% like streaming service S2. Additionally, 12% of the students do not like either service.
 1 If $z\%$ of the students like both services, find the value of z .
 2 If 2000 students were surveyed in total, find the number of students who like only S1 and only S2.

SECTION E | Competency-Based Case Study (4 marks)

12. If R is the relation "is less than" from set $X = \{2,3,5,6\}$ to set $Y = \{1,4,5\}$: 4
 a) Write R as a set of ordered pairs.
 b) Write the domain and range of R.
 c) Find the inverse relation R^{-1}