Discrete Mathematics (8-12)

Variety - Names

DMS = Discrete Mathematical structures

DM = Discrete Mathematics

DS = Discrete Structures

MFCS = Mathematical Foundation for computer Science

Syllabus

UNIT wise

I. Mathematical Logic

II. Set Theory & Algebraic Structures

III. Combinatorics

IV. Graph Theory

chapter wise

1) Propositional Logic
2) First-order Logic
3) set Theory
4) Relations
5) Partial-orderings
6) Functions
7) Algebraic Structures (Groups)
8) Combinatorics
9) Graph Theory

Eng Maths

1) Linear algebra
2) Probability
3) calculus.

Reference Books

1. Discrete Mathematical Structure with Applications to Computer Science – Tremblay & Manohar
2. Discrete Mathematics for Computer Scientist & Mathematicians – Mott, Kandell & Baker.
3. Discrete Mathematics – Kenneth Rosen – 8th edition
4. Discrete Mathematics – C.L.Liu

Set Theory

Set: The collect of well defined objects is known as set.

$A = \{a, b, c\}$, $B = \{1, 2, 3\}$

$a \in A$ $\quad$ $3 \in B$

Cardinality: The number of elements in the given set is known as It's cardinality, represented by $|A|$ (or) $n(A)$

$A = \{a, b, c, d\}$

$|A| = n(A) = 4$

* $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

* $n(A \cap B) = n(A) + n(B) - n(A \cup B)$

* $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(A \cap C) + n(A \cap B \cap C)$

Null Set: A Set with no elements is known as null set

$$\phi = \{\ \}$$

Universal Set: A Set with all possible elements under consideration is known as universal set

$$\mu = U$$

Subset : Set A is said to be subset of set B if all the elements of 'A' are belongs to 'B'

eg-1: $A = \{1,2\}$ $B = \{1,2,3\}$ ✓

$A \subseteq B$

eg-2: $A = \{1,2,3\}$ $B = \{1,2,3\}$ ✓

$A \subseteq B$

Proper Subset : If A is subset of B and $A \neq B$ then A is known as proper subset of B

eg: $A = \{1,2\}$ $B = \{1,2,3\}$ Here $A \subset B$

Equal Sets: If $A \subseteq B$ and $B \subseteq A$ then $A = B$

eg: $A = \{a, b, c\}$ $B = \{a, b, c\}$

$A = B$

$A = \{1, 1, 2, 2, 2\}$

$A = \{1, 2\}$

Power Set: The set of all possible subsets of the given set is known as powerset

size/cardinality

$A = \{1, 2, 3\} \longrightarrow |A| = 3$

$B = \{\{1\}, \{2, 3\}\} \longrightarrow |B| = 2$

$C = \{\{1, 2, 3\}\} \longrightarrow |C| = 1$

$\{\{1\}\} \longrightarrow 1$

Example 1 $A = \{a, b\}$

Power set of $A = P(A) = \{\phi, \{a\}, \{b\}, \{a, b\}\}$

Example 2

$A = \{a, b, c\}$

$P(A) = \{$ ϕ – Null set

$\{a\}, \{b\}, \{c\}$ – Singleton

$\{a, b\}, \{a, c\}, \{b, c\}$ – 2-element

$\{a, b, c\}$ – 3-element = given set $\}$

Example-3

$A = \{1, 2, 3, 4\}$

$P(A) = \{$ ϕ – $4C_0 = 1$

$\{1\}, \{2\}, \{3\}, \{4\}$ – $4C_1 = 4$

$\{1,2\}, \{1,3\}, \{1,4\}, \{2,3\}, \{2,4\}, \{3,4\}$ – $4C_2 = \frac{4 \times 3}{2 \cdot 1} = 6$

$\{1,2,3\}, \{1,2,4\}, \{1,3,4\}, \{2,3,4\}$ – $4C_3 = 4$

$\{1,2,3,4\}\}$ – $4C_4 = 1$

If $|A| = 2$ then $|P(A)| = 4$ ✓

If $|A| = 3$ then $|P(A)| = 8$ ✓

If $|A| = 4$ then $|P(A)| = 16$ ✓

* If $|A| = n$ then $|P(A)| = 2^n$

(Ph) If there are 256 elements in the power set of Set A Then. the number of elements in A = _____

$n[P(A)] = 256 = 2^8 = 2^n$

$n[A] = 8$

Q If $A = \{1, 2\}$ Then find 1) $P(A)$

2) $P[P(A)]$