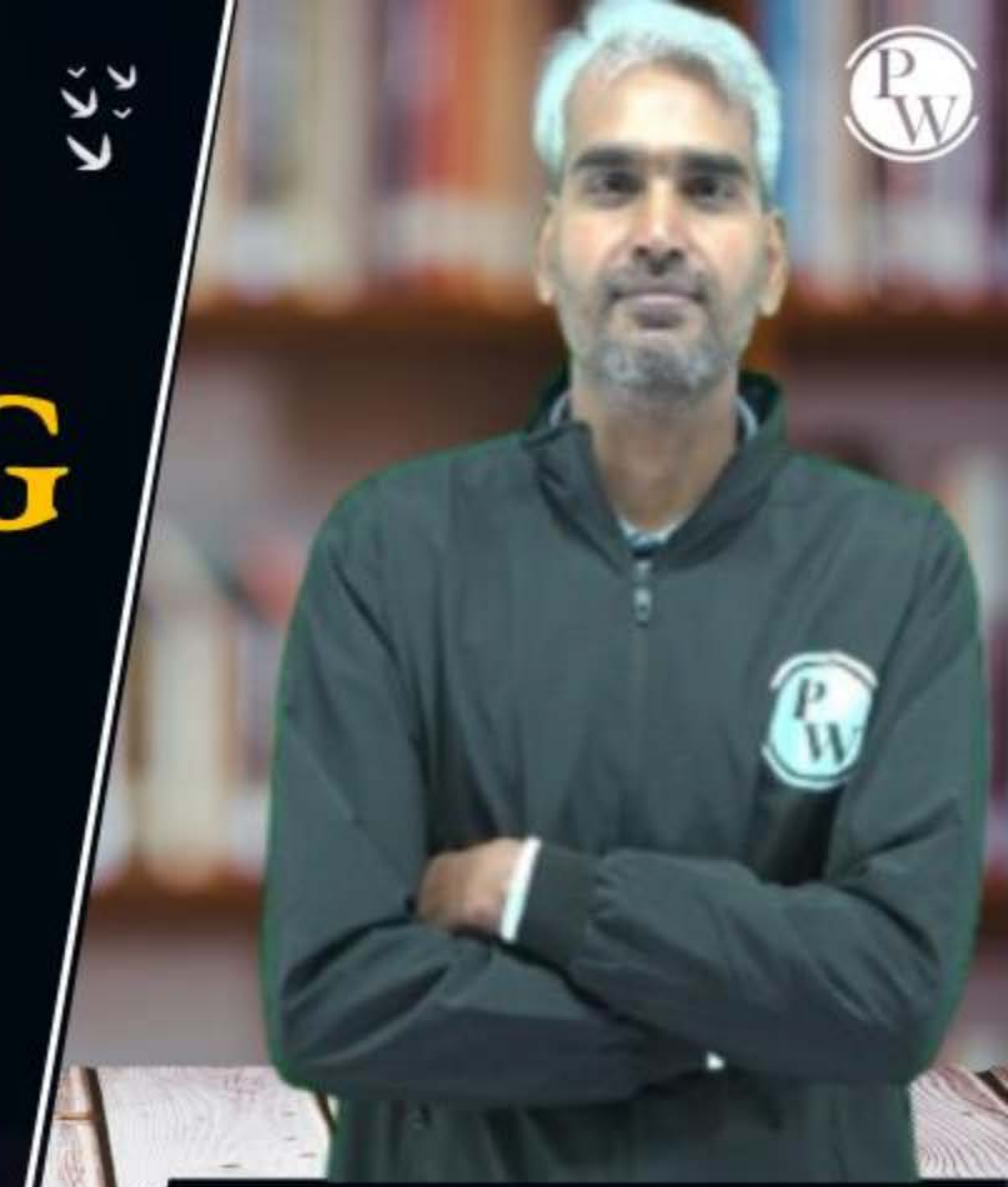
CS & IT ENGINEERING

Discrete Mathematics

Set Theory and Algebra

DPP-04

Discussion Notes



By- Vishal Rawtiya Sir

[MCQ]

#Q. The POSET
({2, 3, 5, 30, 60, 120, 180, 360}; |) is________.

A Join semi lattice but not a meet semi lattice.

B Not join semi lattice but a meet semi lattice.

C A lattice

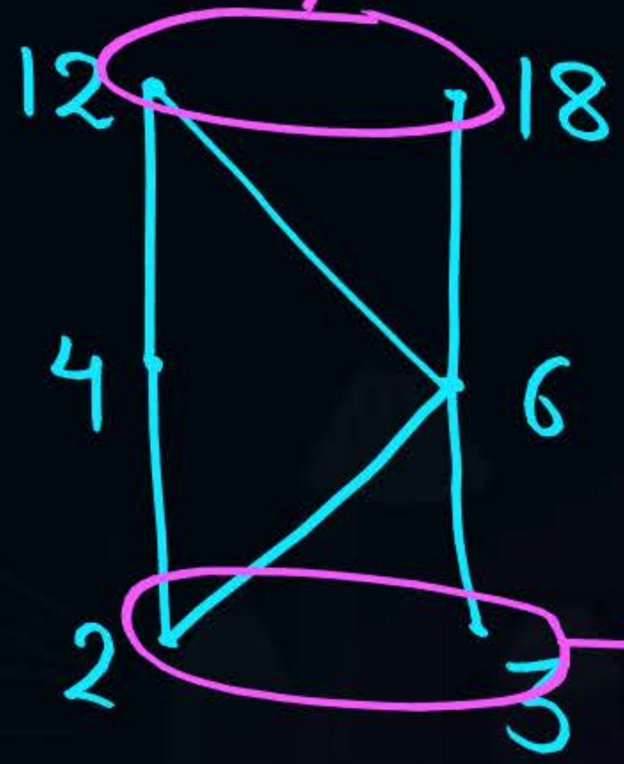
D Not a semi lattice

Multiple minimal elements
∴ not a meet-semi lattice

[MCQ]

#Q. The POSET $(\{2, 3, 4, 6, 12, 18\}; |)$ is________.

Two maximal ∴ not a join semi-lattice



Two minimal, ∴ Not a meet semi-lattice

A Join semi lattice but not a meet semi lattice.

B Not join semi lattice but a meet semi lattice.

C A lattice

D Not a semi lattice

[MCQ]

#Q. Consider the following statements

(False) S1: Every lattice is a totally ordered set.

(True) S2: Every totally ordered set is a lattice.

it is a lattice but not a totally ordered set

A S1 is true and S2 is false

B S1 is false but S2 is true.

C Both S1 and S2 are true.

D Neither S1 nor S2 are true.

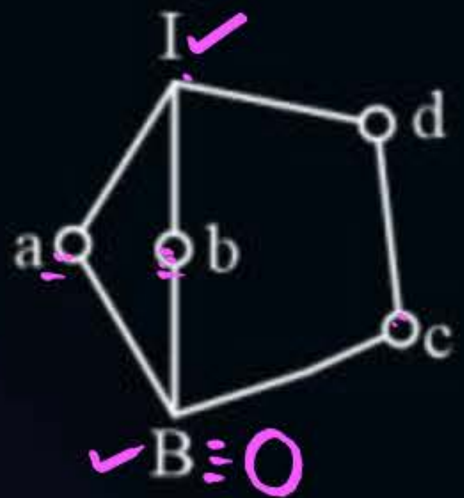
[MSQ]

given

#Q. Which of the following is/are true for above hasse diagram?

$\bar{I} = B$

$\bar{B} = I$



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

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

$\bar{c} = b, a$

$\bar{d} = b, a$

More than one complement

$\therefore$ Not distributive

A. Above hasse diagram represent a complemented lattice.

B. Above hasse diagram represent a distributive lattice.

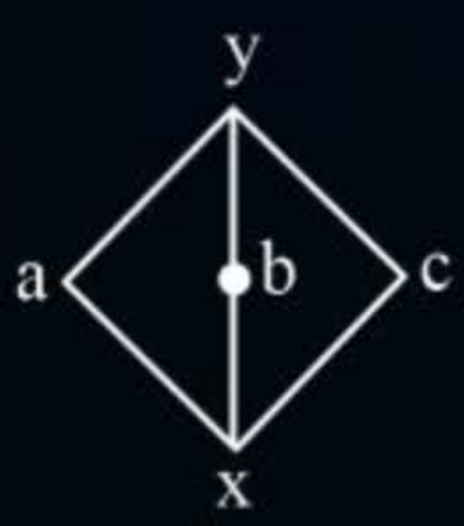
C. Elements a, b, c, and d have equal number of complements.

D. Every element of the above lattice has at most one complement.

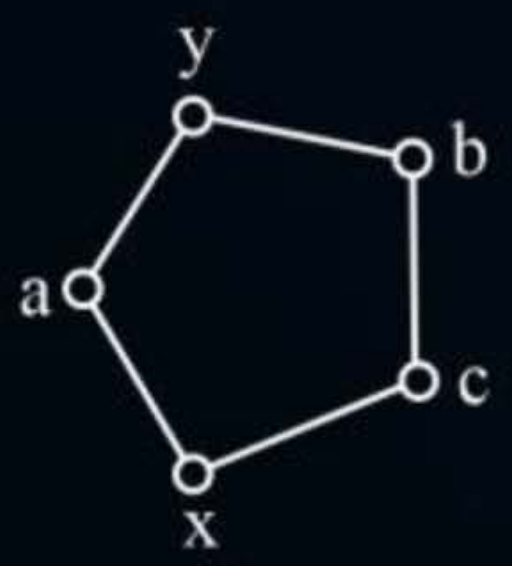
[MSQ]

#Q. Which of the following is/are true for the lattice 'L' with respect to POSET ({1,2,5,3,9,90} , |)

L =



L_1

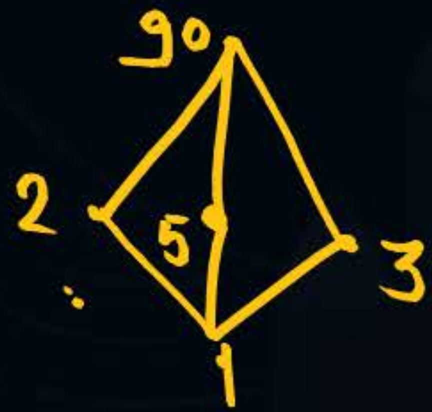


L_2

A) L has a sub-lattice which is isomorphic to L1.

B) L has a sub-lattice which is isomorphic to L2.

X ≡



Y ≡

C) L has no sub-lattice which is isomorphic to either L1 or L2.

D) L is not a distributive lattice.

[MCQ]

$(P(A), \subseteq)$

$P(A) = \{\phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}, \{a,b,c\}\}$

#Q. In a Boolean algebra with respect to set A where $|A| = n$ consider the following statements.

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

- S1: Number of vertices in the hasse diagram are 2^n
- S2: Number of edges in the hasse diagram are $n \cdot 2^{n-1}$

Which of the following is true?

A S1 is true and S2 is false

B S1 is false but S2 is true

C Both S1 and S2 are true. ✓

D Both S1 and S2 are false.

$A = \{a\}$

$|E| = 1 \cdot 2^{1-1} = 1$

$\bar{0} = I$

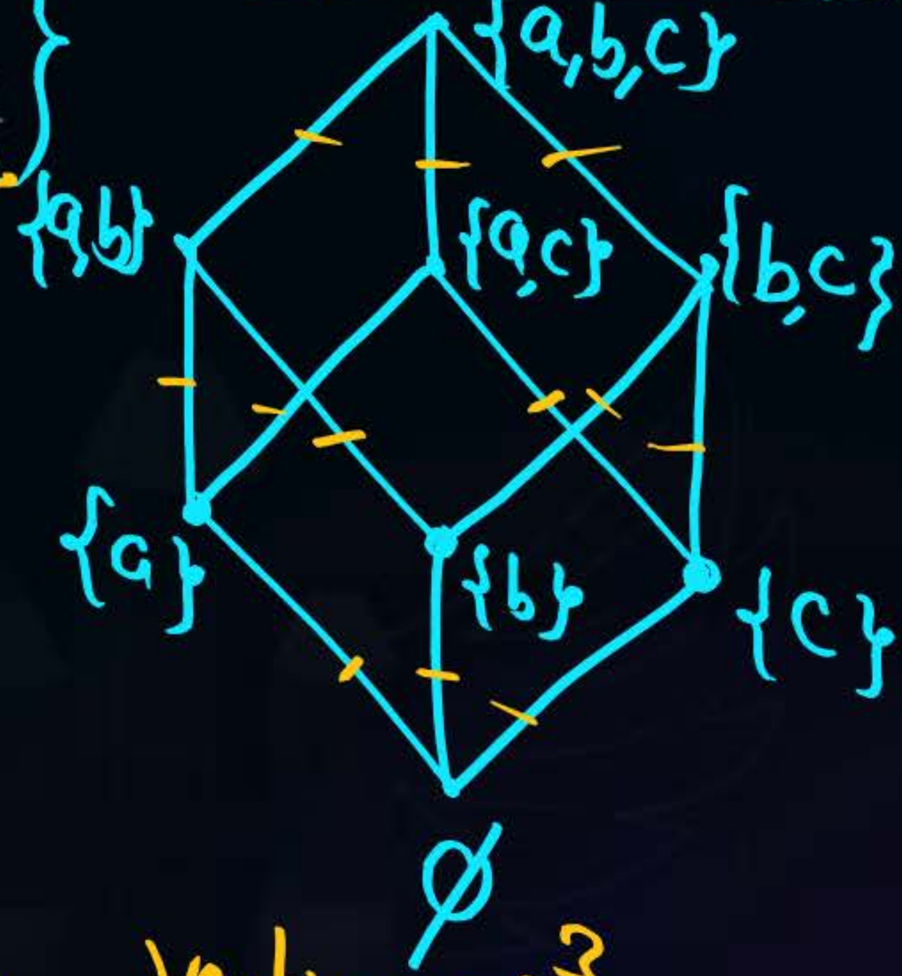
$\bar{I} = 0$

$A = \{a, b\}$

$\bar{0} = I, \ \bar{I} = 0$

$\bar{a} = b, \ \bar{b} = a$

$|E| = 2 \cdot 2^{2-1} = 2 \cdot 2 = 4$



Vertices $= 2^3$

Edges $= 3 \cdot 2^{3-1} = 3 \times 4 = 12$

[NAT] {GATE-2024}

#Q. Let P be the partial order defined on the set $\{1,2,3,4\}$ as follows

$P = \{(x, x) \mid x \in \{1, 2, 3, 4\}\} \cup \{(1, 2), (3, 2), (3, 4)\}$

The number of total orders on $\{1,2,3,4\}$ that contains P is 5 ________.

$P = \{(1,1), (2,2), (3,3), (4,4), (1,2), (3,2), (3,4)\}$

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

$\therefore$ Total number of total order relⁿ Possible $= 4! = 24$

1 2 3 4	2 1 4 3	3 1 2 4	4 1 2 3
1 2 4 3	2 1 3 4	3 1 4 2	4 1 3 2
1 3 2 4	2 3 1 4	3 2 1 4	4 2 1 3
1 3 4 2	2 3 4 1	3 2 4 1	4 2 3 1
1 4 2 3	2 4 1 3	3 4 1 2	4 3 1 2
1 4 3 2	2 4 3 1	3 4 2 1	4 3 2 1

[MSQ]

$(Z, \leq)$

#Q. Which of the following is/are always true for any lattice?

False: Because lattice need not be bounded. { eg $(N, \leq)$, there is no maximum element }

A ✗ There exists exactly one minimum and exactly one maximum element.

True

B There exists at most one minimal and at most one maximal element.

C Least upper bound and greatest lower bound exists for every pair of elements.

D ✗ Every element has a unique complement.

false

THANK - YOU