CS & IT ENGINEERING

Theory of Computation

DFA

Lecture No.- 05

By- Venkat sir

Topics to be Covered

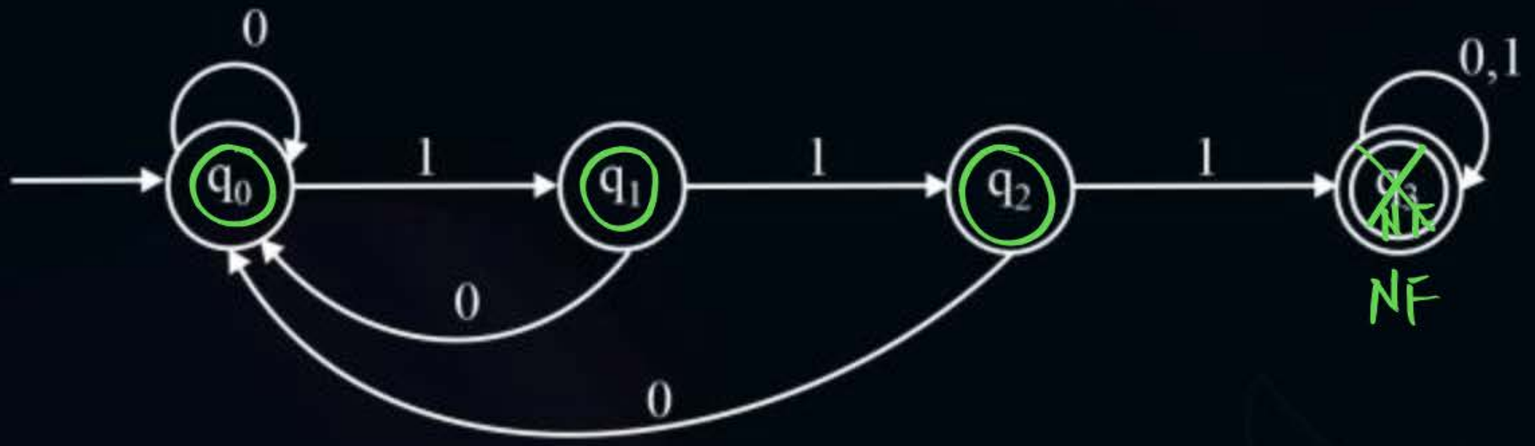
- **Topic** Finite Automaton & Regular Languages.
- **Topic** Pushdown Automata & Context free Languages.
- **Topic** Turing Machine & Recursive Enumerable Languages.
- **Topic** Undecidability.

BOOKS:

1. PETER LINZ
2. MICHAEL SIPSER
3. HOPCROFT & ULLMAN

MCQ

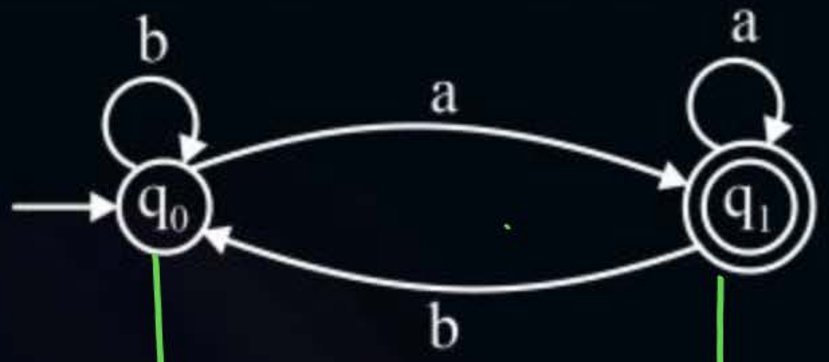
#Q. Consider the finite automata m, not having Substring 111



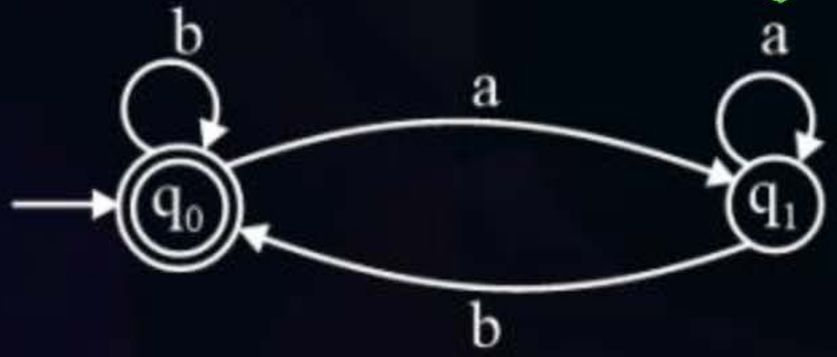
The language accepted by m is, over the alphabet {0,1}

Topic : Complement of DFA

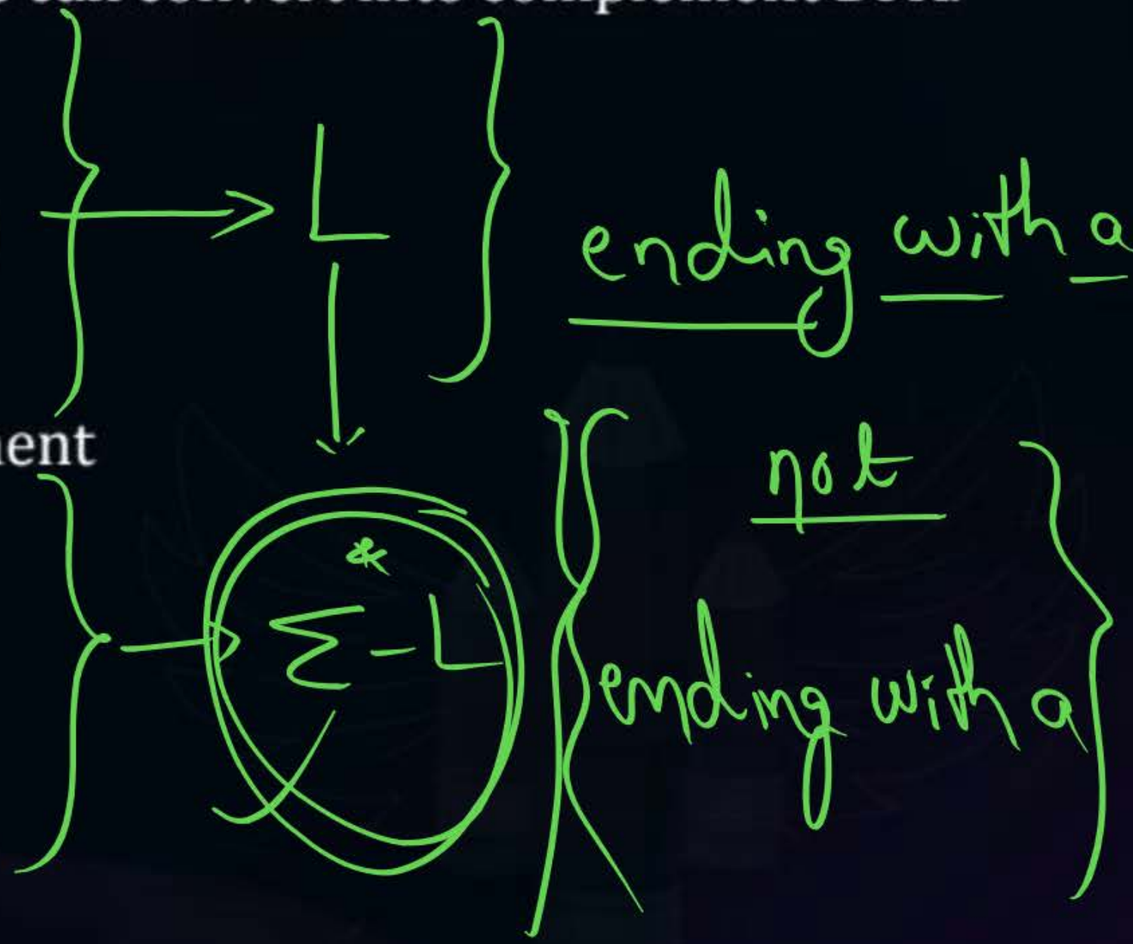
By interchanging final and non final states we can convert into complement DFA.



Set of all strings ending with a after complement



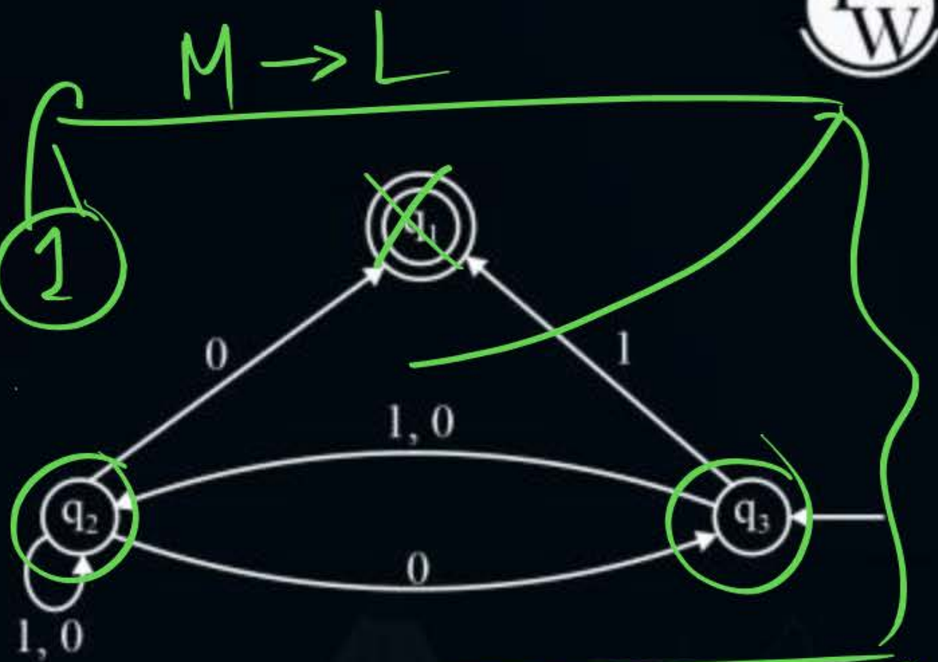
Set of all string .... Ending with



MCQ

#Q. Consider the NFA M shown below.

Let the language accepted by M be L. Let L_1 be the language accepted by the NFA M_1, obtained by changing the accepting state of M to a non-accepting state and by changing the non-accepting state of M to accepting states. Which of the following statements is true?



A $L_1 = \{0, 1\}^* - L$

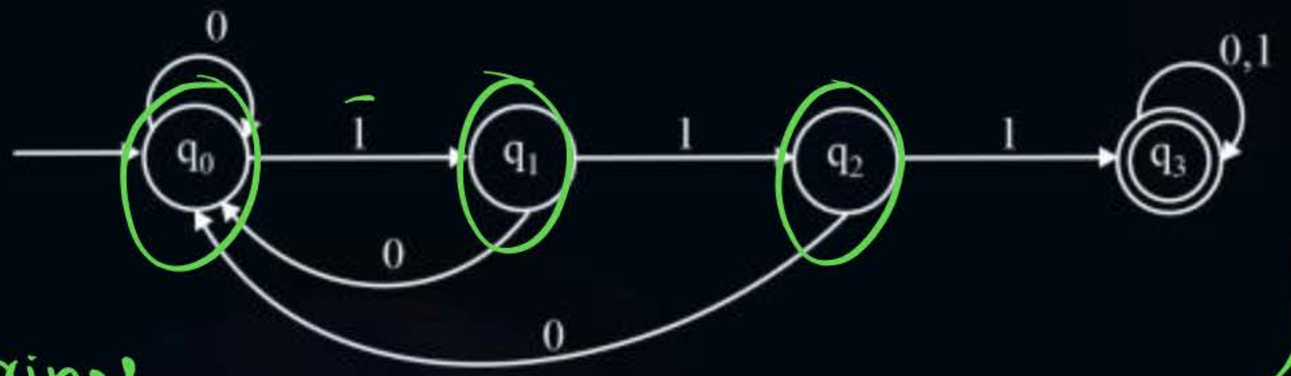
B $L_1 = \{0, 1\}^*$

C $L_1 \subseteq L$

D $L_1 = L$

MCQ

#Q. Consider the finite automata m.



Sub string 111

S{16} 16-8=8

no. of strings

Let S denotes the set of six bit binary strings in which first and fourth bits are 1. Accepted by the machine which is obtained by interchanging final and non final states in m. The number of strings in S accepted by M is

A 1

B 4

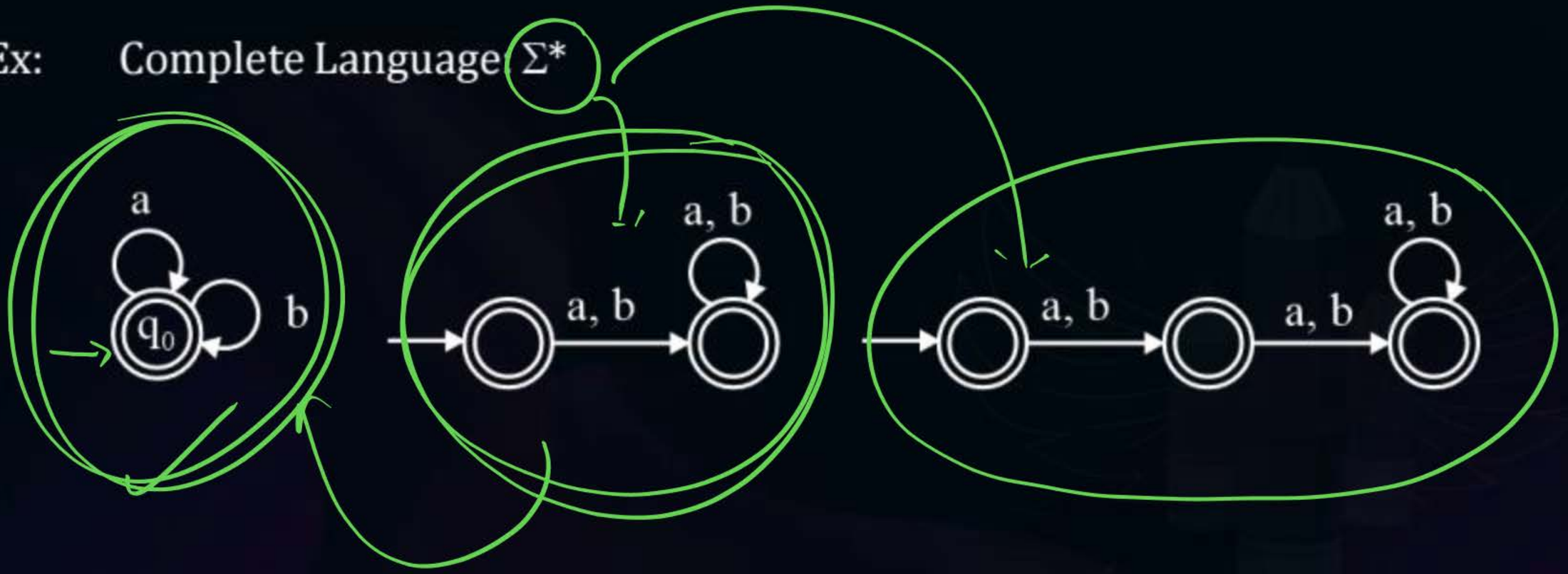
C 7

D 8

Topic : Minimization of DFA

→ For a given regular language even though many DFA exist but minimal state DFA is unique.

Ex: Complete Language Σ^*



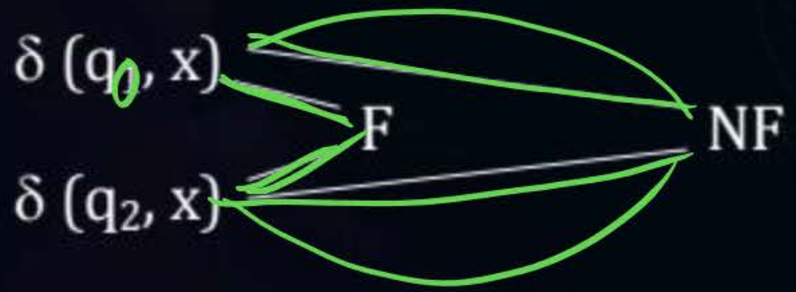
Topic : Minimization Algorithm

1. State equivalence algorithm
2. Table filling algorithm

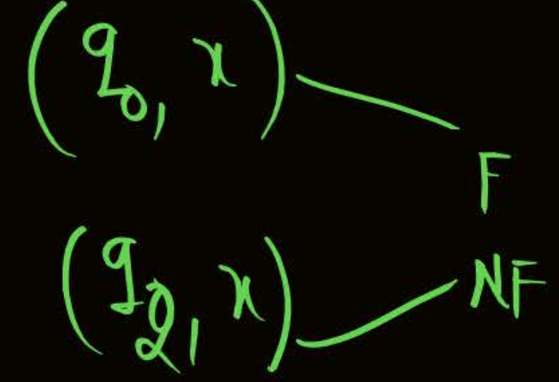
We can apply only for DFA

Equivalent States:

Two states q_0, q_1 are said to be equivalent both $\delta(q_0, x)$ and $\delta(q_2, x)$, $\forall\ x \in \Sigma^*$ should result either final state or non final state.



① Distinguishable states



Topic : Procedure of minimization

1. Elimination (inaccessible) states.

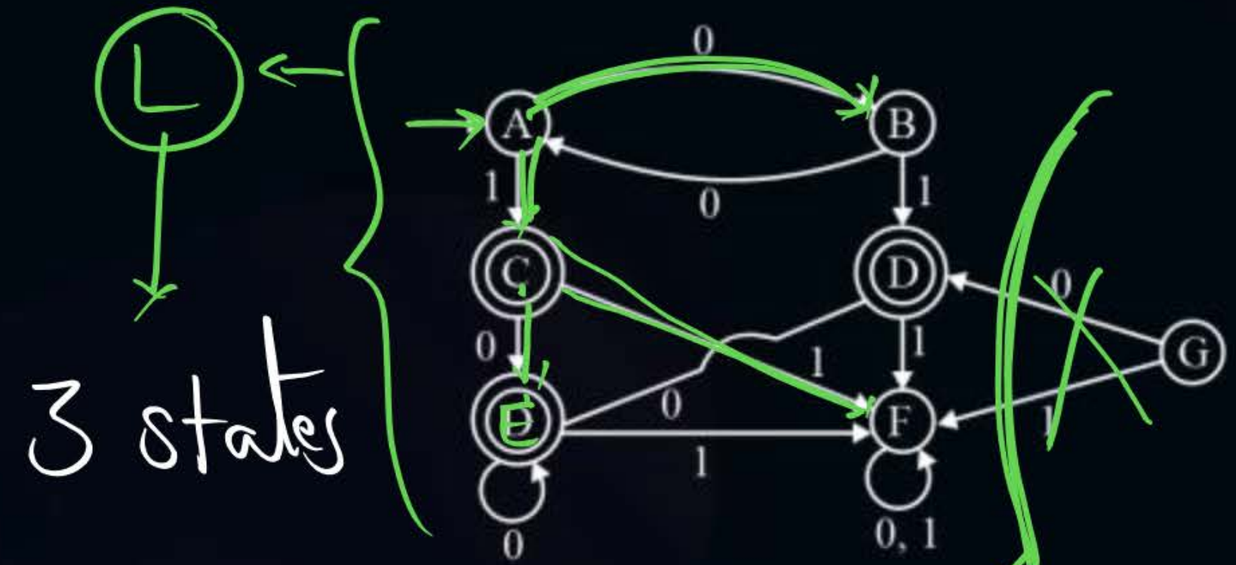
inaccessible state:

Any State which is not reachable from ~~dead~~ initial state is inaccessible state.

2. Apply algorithm steps
3. Merge single group into one state
4. Construct new minimized DFA

Topic : Procedure of minimization

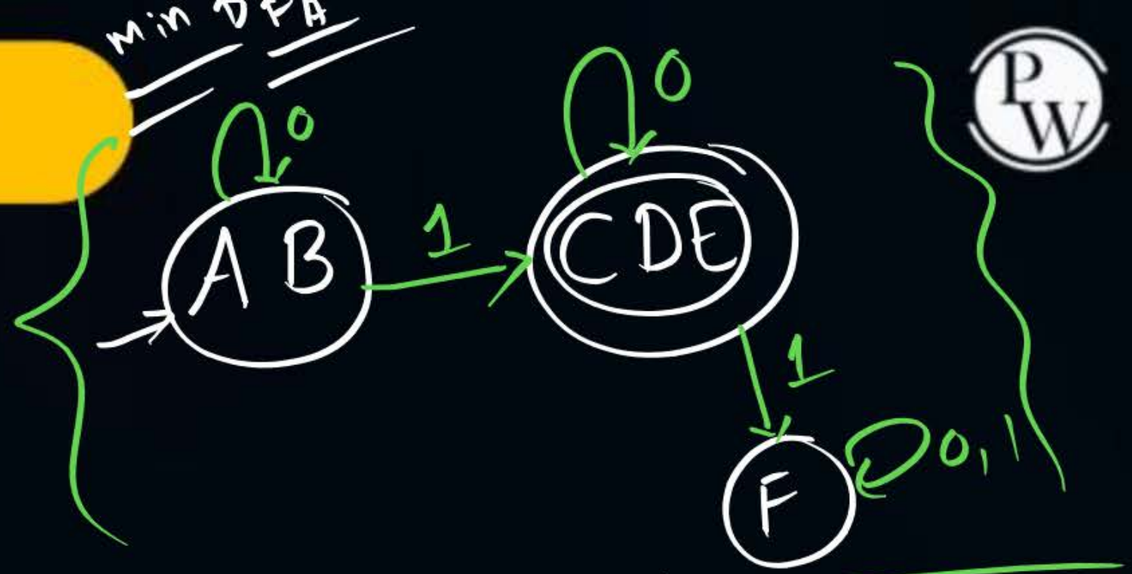
1. Reduce states of following DFA



3 states

Step-1: Elimination inaccessible state.

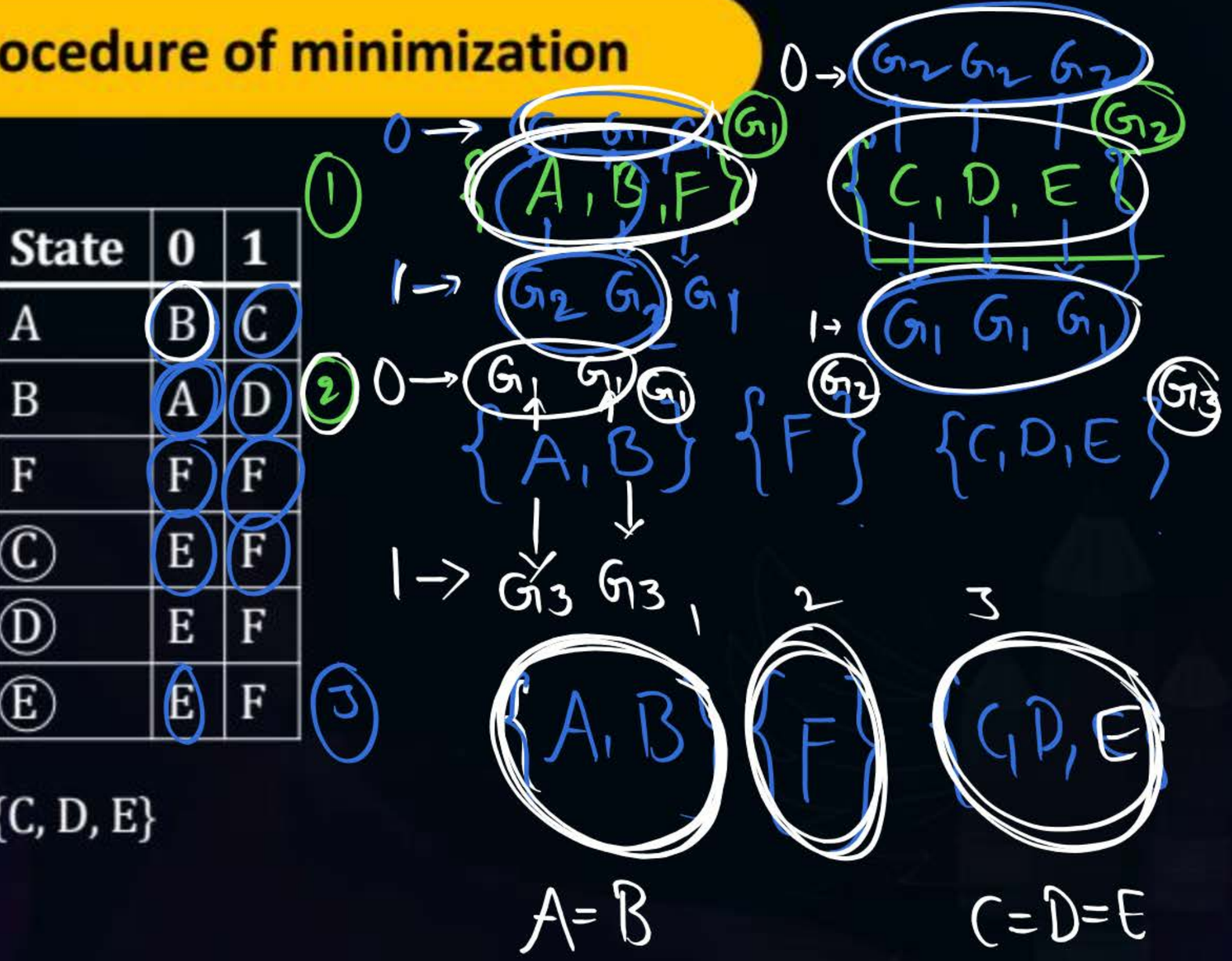
Note: Dead state is different from inaccessible state.



Topic : Procedure of minimization

Step:2

State	0	1
A	B	C
B	A	D
F	F	F
C	E	F
D	E	F
E	E	F



Algorithm:

1. {A, B, F} {C, D, E}
2.
3.

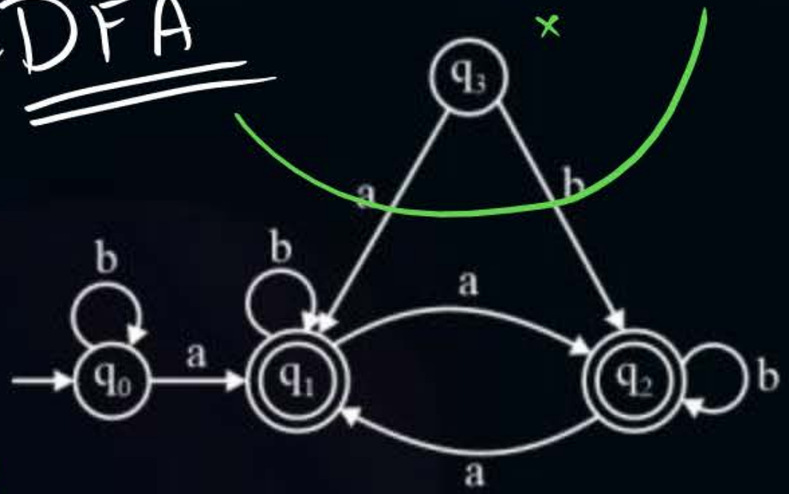
Topic : Procedure of minimization

Minimized DFA

Topic : Procedure of minimization

Consider the following Finite State Automation · How many states in minimal DFA?

① DFA ✓



Table

	a	b
→ q_0	q_1	q_0
q_1	q_2 ✓	q_1 ✓
q_2	q_1 ✓	q_2 ✓

② $\{q_0\}$ $\{q_1, q_2\}$

a → G_2 G_2

b → G_2 G_2

$\{q_1, q_2\}$ G_2

$\{q_0\}$ G_1

$\{q_0\}$ $\{q_1, q_2\}$

Topic : Procedure of minimization

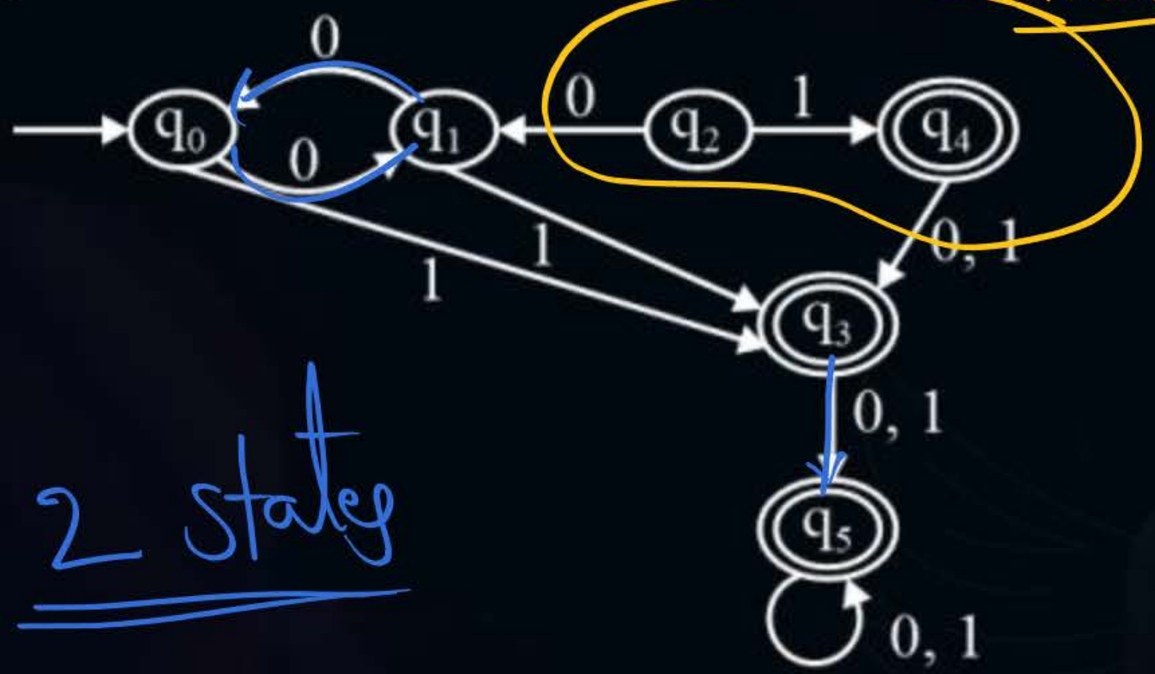
How many states in minimal DFA for the given DFA?

(a) 1

(b) 2

(c) 3

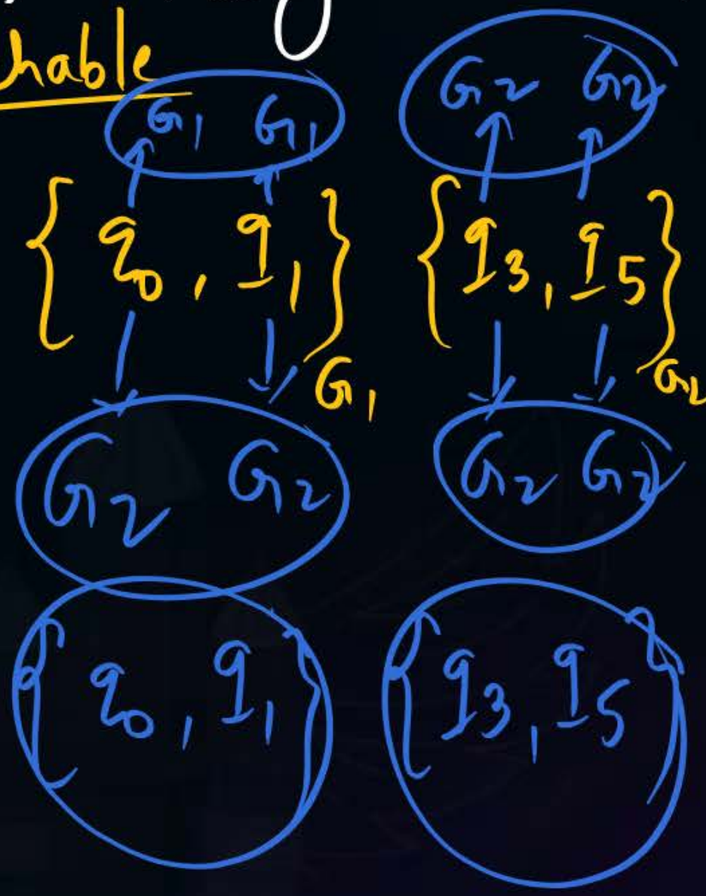
(d) 5



Unreachable

2 states

Minimize given DFA



2 mins Summary

- Topic One
- Topic Two
- Topic Three
- Topic Four
- Topic Five

Complement

minimization

H.W

GATE 2024

min of DFA Question

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THANK - YOU