

CS & IT ENGINEERING



Theory of Computation

DFA

Lecture No.- 03



By- Venkat sir

Recap of Previous Lecture



Topic

alphabet, string, lang

Topic

DFA
acceptance method

P/Qs



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

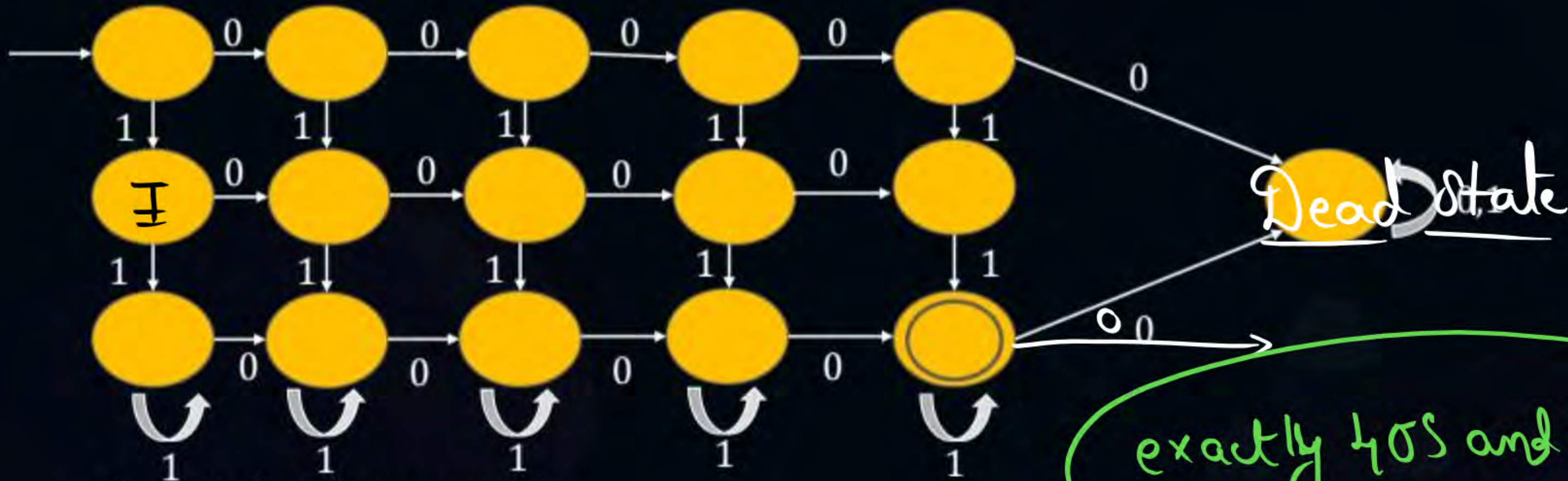
①

DFA \rightarrow language

②

language \rightarrow DFA

#Q. Identify language accepted by following DFA



Set of all strings contains

exactly 4 0's and atleast two 1's

A Length of the string atleast 6

B # 0's exactly 4 and 1's atleast 3

C # 0's atleast 4 and # 1's exactly 2

D None

00000000

00001

MCQ



#Q. The number of binary strings of length n accepted by the following finite automata is-

$$\Sigma = \{0, 1\}$$

Set of all strings starting with 11

A $\{2^n | n \geq 0\}$

B $\{2^{n-1} | n \geq 1\}$

C $\{2^{n-2} | n \geq 2\}$

D $\{2^{n-3} | n \geq 3\}$

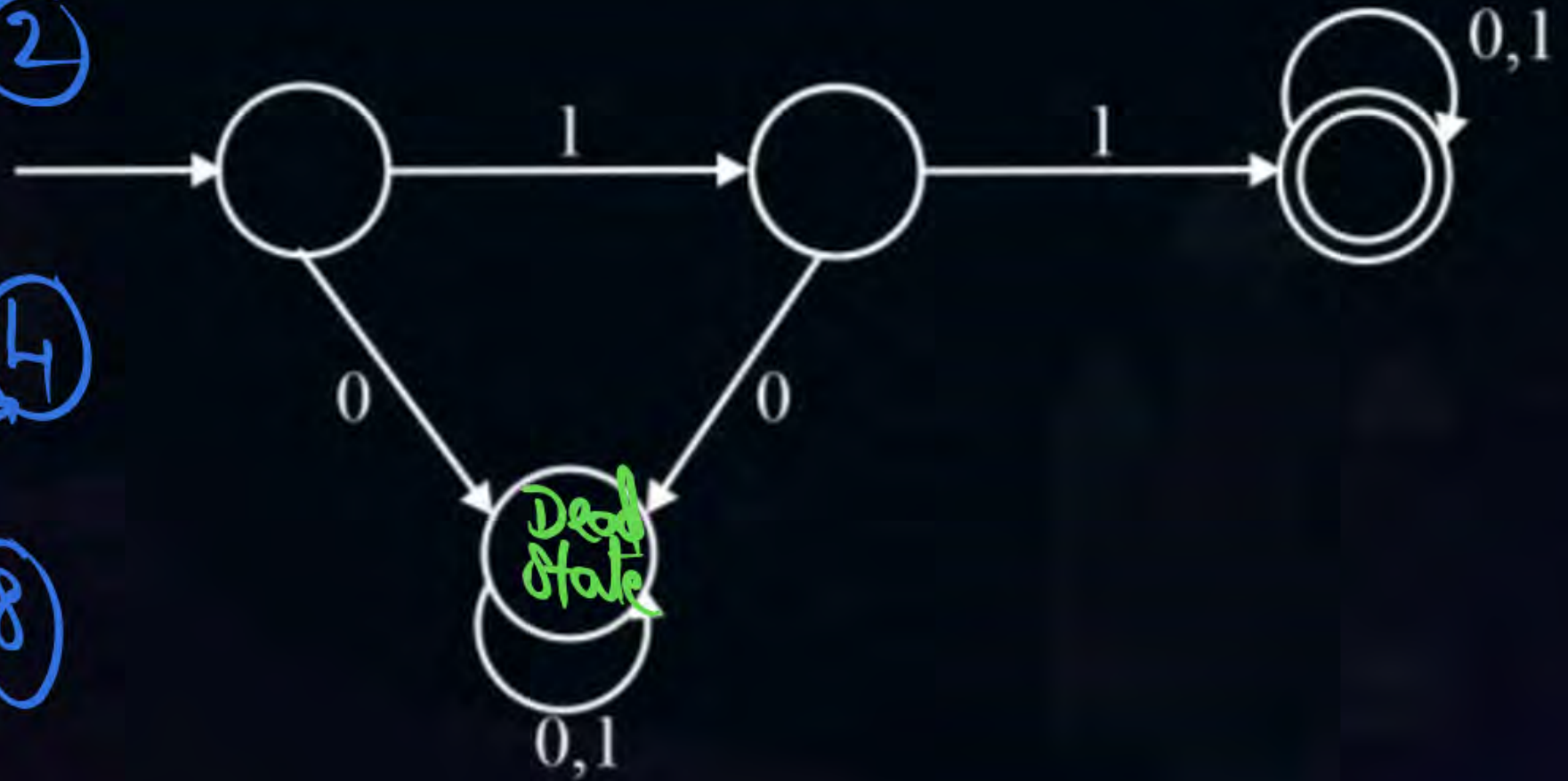
$n=2 \rightarrow 1$

$n=3 \rightarrow 2$

$n=4 \rightarrow 4$

$n=5 \rightarrow 8$

2^{n-2}



How many states in DFA $n, m \geq 1$

#Q. Construct DFA for the language: $L = \{a^n b^m \mid n > m\}$

(a) 2 ✓

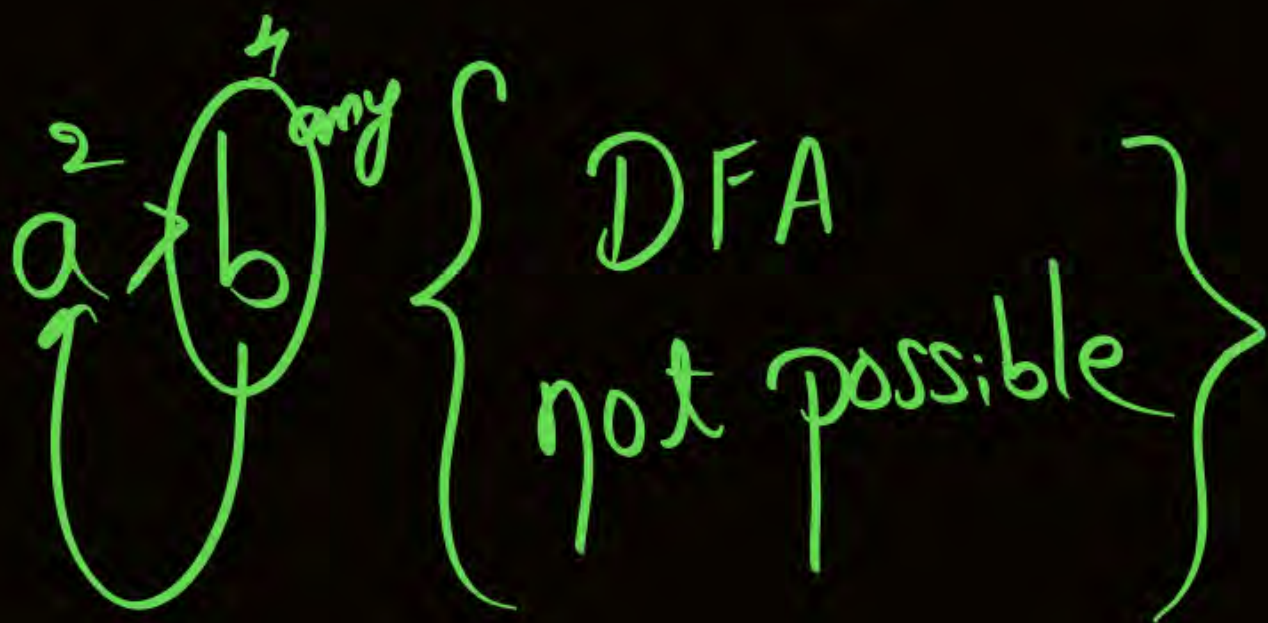
DFA not possible

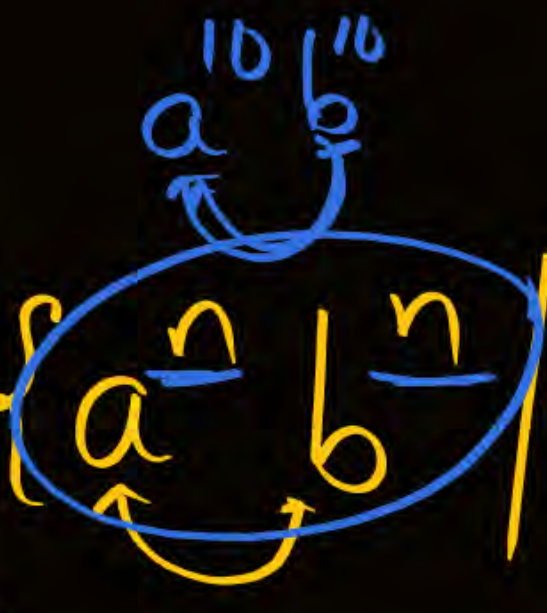
(b) 3 ✓

(c) 4 ✓


(d) ~~none!~~

$$L_1 = \{a^n b^m \mid n > m\}$$



$$L_1 = \{ \underbrace{a^n b^n}_{\text{Diagram}} \mid n \geq 1 \} \quad \underline{\text{DFA}} \quad \underline{\text{not}} \quad \underline{\text{possible}}$$


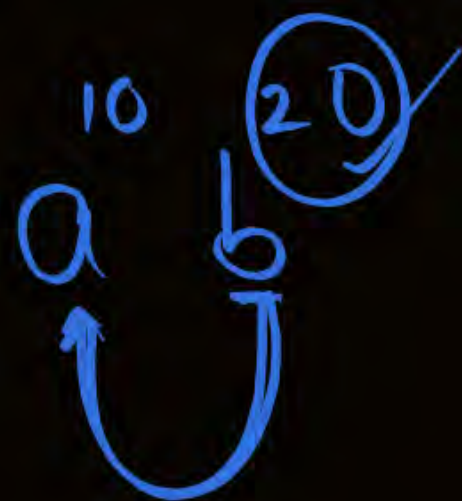
The diagram shows the expression $a^n b^n$ enclosed in a blue oval. A blue arrow points from the 'b' back to the 'a', indicating a dependency or matching requirement between the two parts of the string.

$$\{ \underline{ab}, \underbrace{a^2 b^2}, \underbrace{a^3 b^3} \dots \}$$


The diagram shows the strings $a^2 b^2$ and $a^3 b^3$ with blue arrows pointing from the 'b' back to the 'a' in each, indicating the matching requirement for each part of the string.

$$L_2 = \{ a^n b^{2n} \mid n \geq 0 \} \rightarrow \text{DFA}$$

Dependency



not possible ✓

$\{a^n b^n\}$

if Dependency exist \rightarrow DFA \times

no Dependency

\rightarrow DFA \checkmark

$\{a^n b^m\}$

$a^{10} b^{\text{any}}$ ✓

$L_2 = \{a^n b^m \mid n, m \geq 0\}$ DFA ✓

$\{a^1 b^2, a^2 b^{100} \dots\}$

$a^{20} b^{\text{any}}$
✓

$a^n b^m$

#Q. For which of the following languages DFA is possible

1. $L = \{a^n b^m \mid n, m \geq 1\} \rightarrow \underline{\text{DFA possible}}$

2. $L = \{a^n b^n \mid n \geq 1\} \rightarrow \text{DFA not possible}$

3. $L = \{a^n b^m \mid n < m\} \rightarrow \text{not possible}$

4. $L = \{a^n b^m \mid n \neq m\} \rightarrow \text{not possible}$

5. $L = \{a^n b^m c^{n+m} \mid n, m \geq 1\} \rightarrow \text{not possible}$

6. $L = \{a^n b^{2m} \mid n, m \geq 1\}$

$\{a^n b^{2m}\} \rightarrow \text{DFA possible} \checkmark$

$\{a^n b^{2m}\} \rightarrow \underline{\text{DFA possible}}$

$a^2 b^{\text{any}}$

$L_5 = \{a^n b^m c^{n+m} \mid n, m \geq 1\}$ not possible.

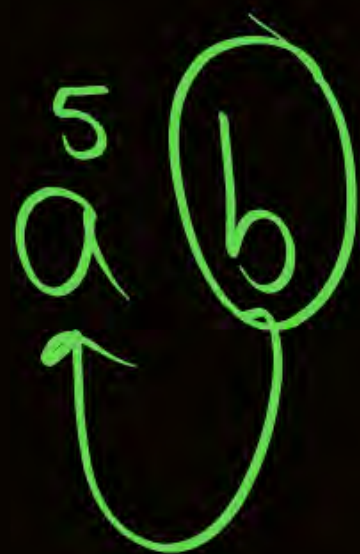


$$\{a^n b^m \mid n \neq m\}$$

$$\{a^n b^m \mid n > m\} \quad (a) \quad \{a^n b^m \mid n < m\}$$

x x

$$\{a^n b^m \mid n < m\}$$



MCQ



#Q. Which of the following are regular sets?

1. $\{a^n b^{2m} \mid n \geq 0, m \geq 0\}$
2. $\{a^n b^m \mid n = 2m\}$
3. $\{a^n b^m \mid n \neq m\}$
4. $\{x c y \mid x, y \in \{a, b\}^*\}$

A

1 and 4 only

B

1 and 3 only

C

1 only

D

4 only



Topic : DFA Construction

Construct DFA for the following Language.

1. $L = \{a^n b^m \mid n, m \geq 1\}$
2. $L = \{a^n b^n \mid n \geq 1\}$
3. $L = \{a^n b^m \mid n < m\}$
4. $L = \{a^n b^m \mid n \neq m\}$
5. $L = \{a^n b^m c^{n+m} \mid n, m \geq 1\}$
6. $L = \{a^n b^{2m} \mid n, m \geq 1\}$



Topic : DFA Construction

If comparison exist between symbols of language then DFA is not possible.



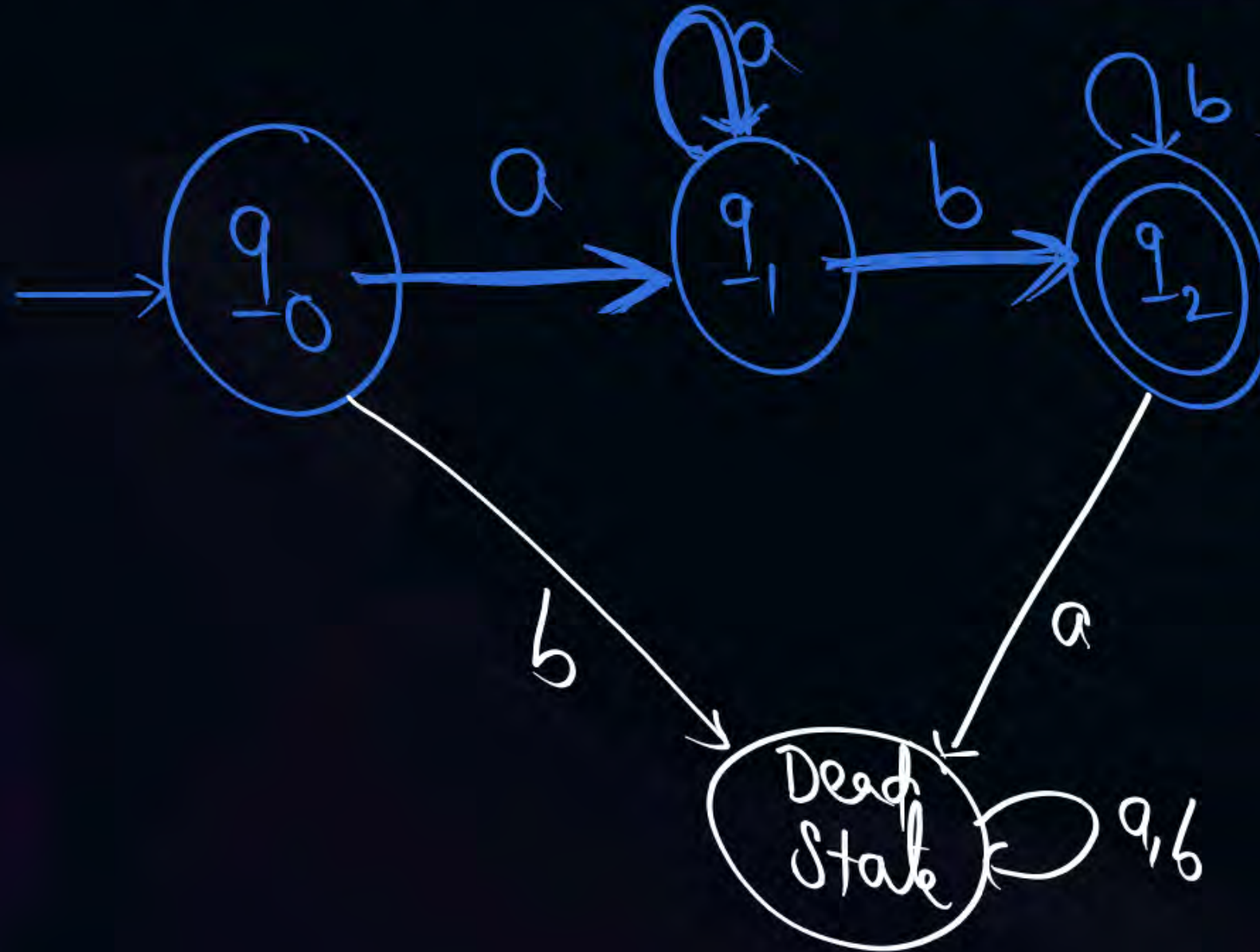
Topic : DFA Construction



Construct DFA for the following Language.

$$L = \{a^n b^m \mid n, m \geq 1\}$$

$\{ab, aab, abb, \dots\}$



3x



Topic : DFA Construction

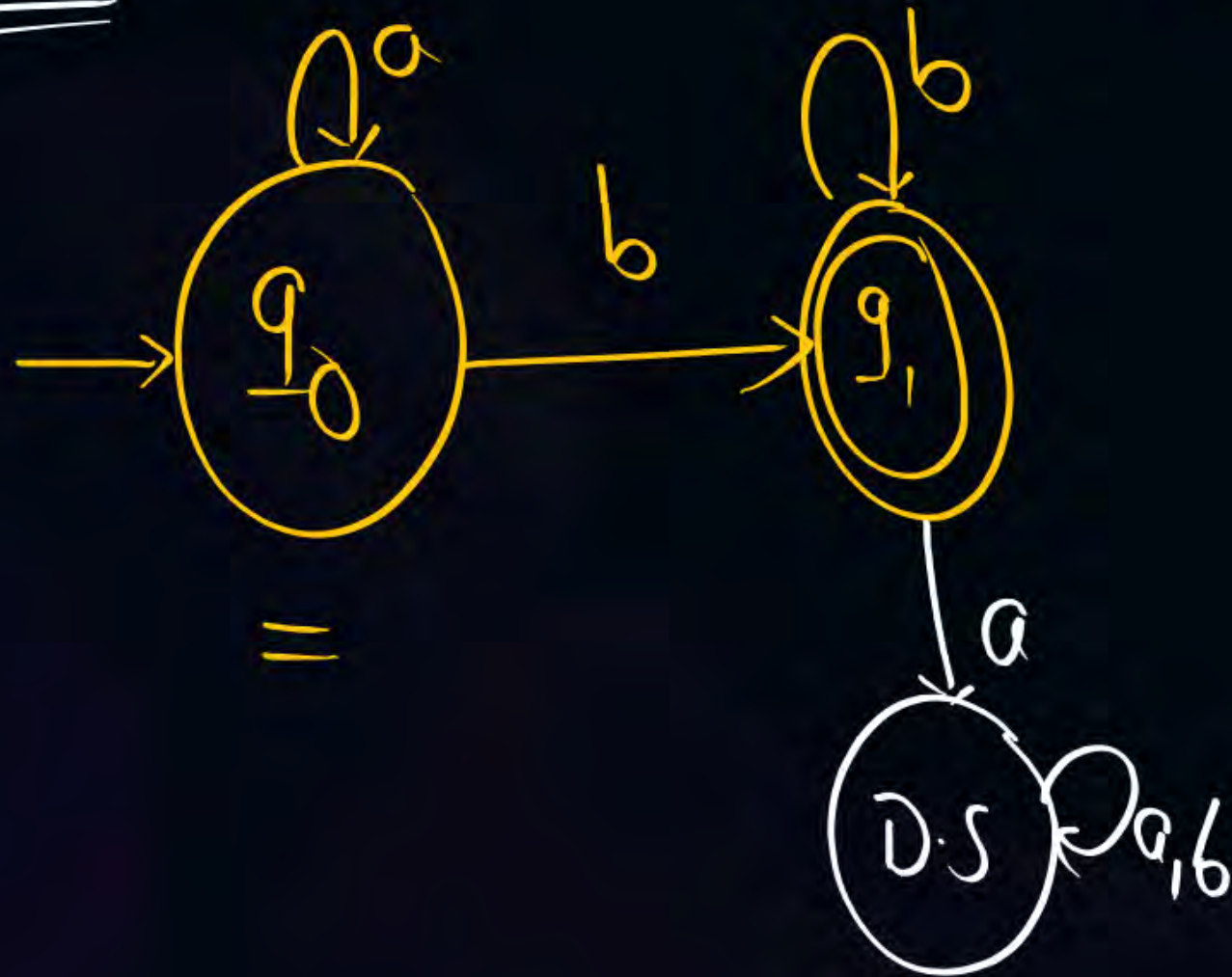
$$L = \{a^n b^m \mid n \geq 0, m \geq 1\}$$

Construct DFA for the following Language.

$$\left\{ \begin{array}{l} b, b^2, \dots \\ ab, a^2b, \dots \end{array} \right\}$$

b^n
 $a^n b^m$

DFA



3



Topic : DFA Construction

Construct DFA for the following Language.

{4 states}

$$L = \{a^n b^m \mid n \geq 1, m \geq 0\}$$

$\{a, a^2, a^3, \dots\}$
 $\{ab, a^2b, a^3b, \dots\}$
 $\{a^n b^m\}$



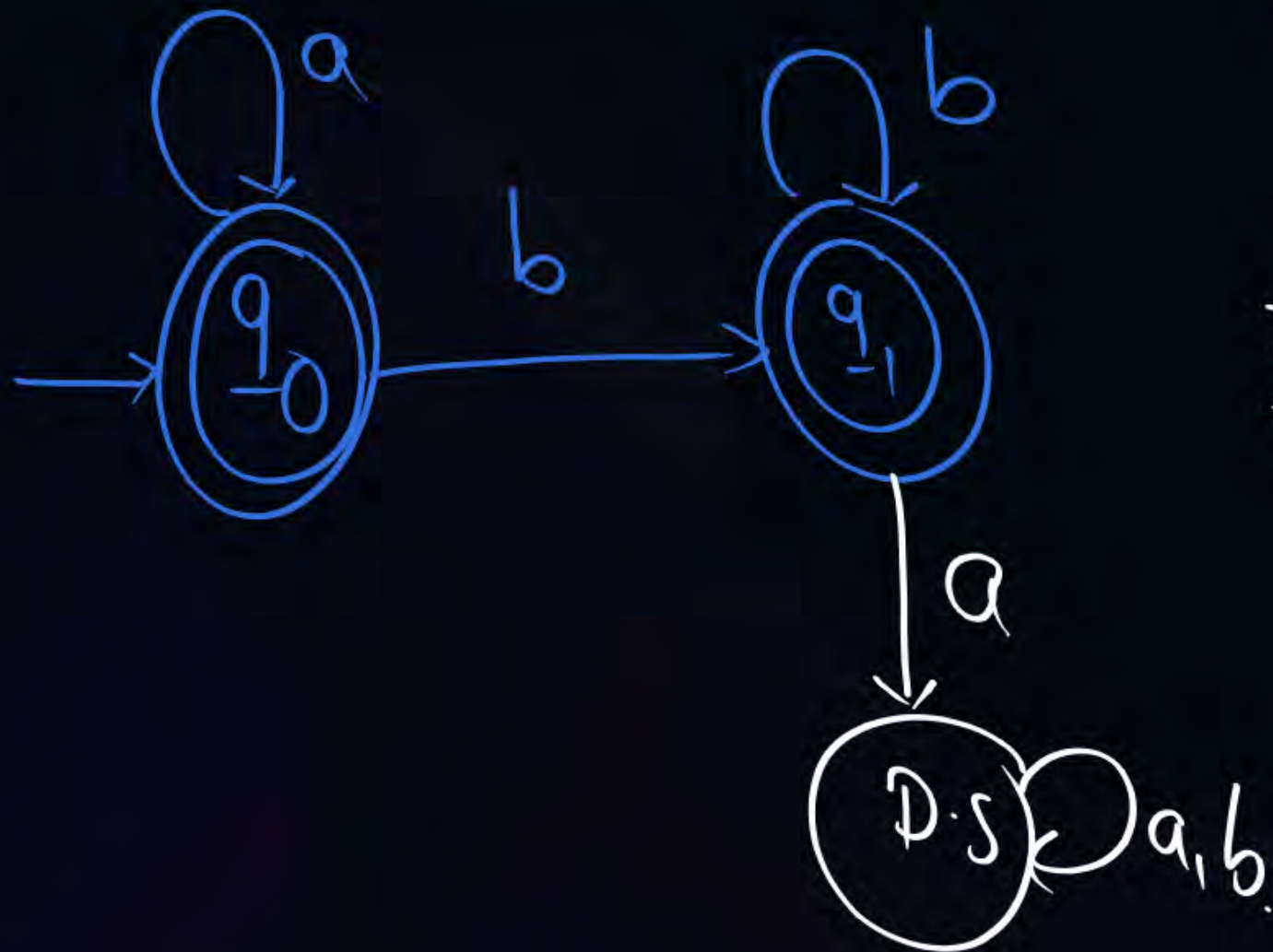


Topic : DFA Construction

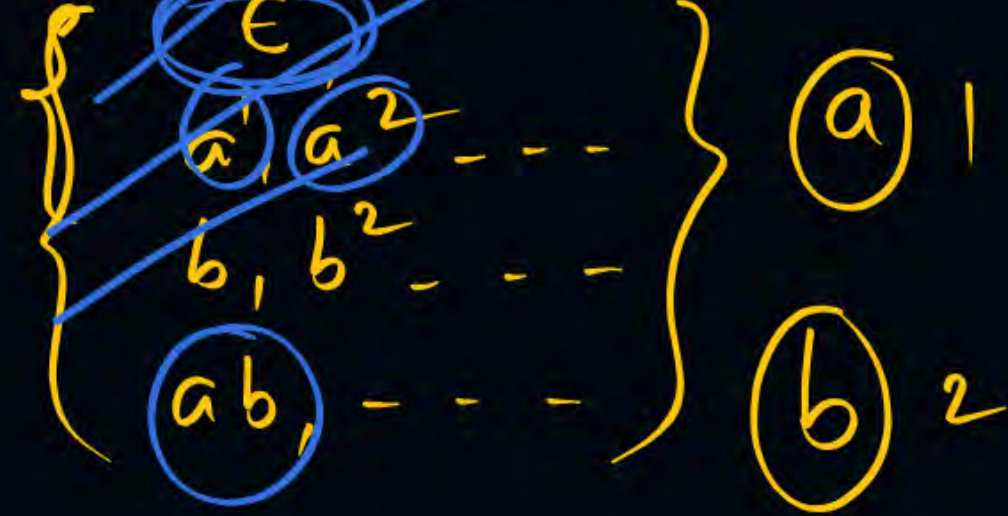


Construct DFA for the following Language.

aba



$$L = \{a^n b^m \mid n, m \geq 0\} \quad \text{Language}$$

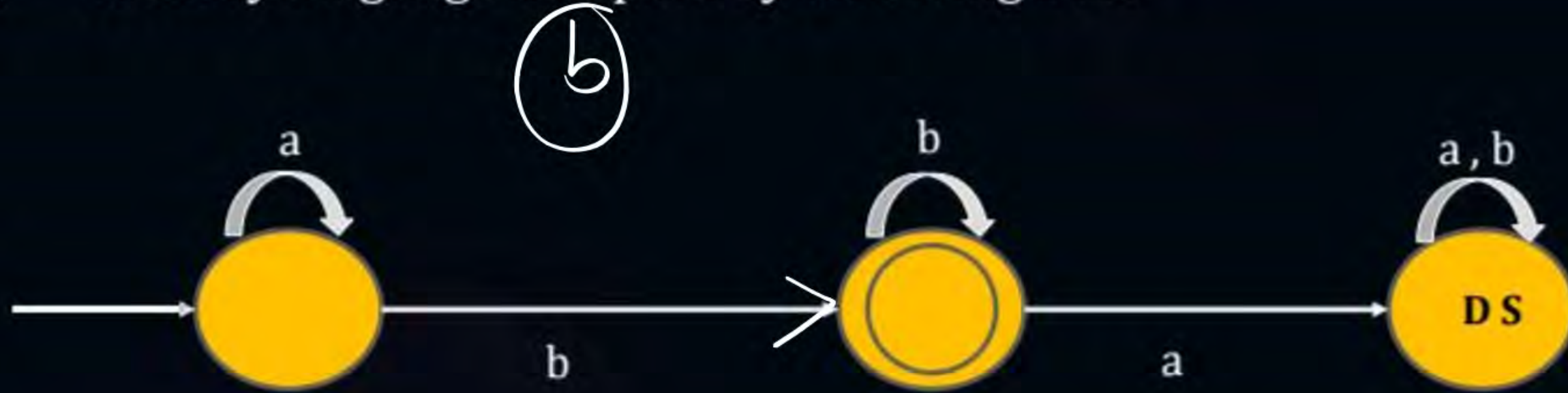


3 states

~~(c)₃~~

(d)₄

#Q. Identify language accepted by following DFA



A $L = \{a^n b^m \mid n, m \geq 1\}$ ^x (ab)

C $L = \{a^n b^m \mid n, m \geq 0\}$ $\in X$

B $L = \{a^n b^m \mid n \geq 1, m \geq 0\}$ ^a

D None

#Q. Identify language accepted by following DFA

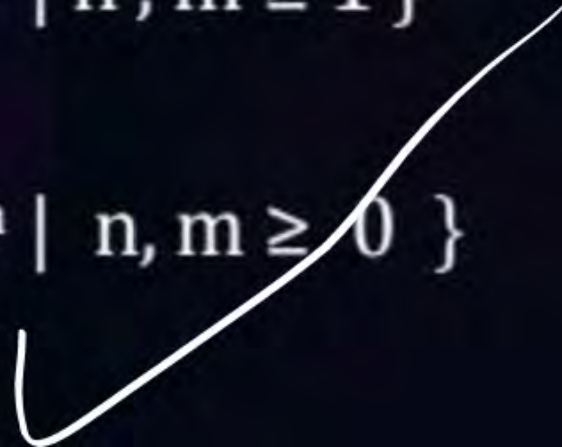



A $L = \{a^n b^m \mid n, m \geq 1\}$


C $L = \{a^n b^m \mid n, m \geq 0\}$


B $L = \{a^n b^m \mid n \geq 1, m \geq 0\}$


D None












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Notifications

On









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THANK - YOU