CS & IT ENGINEERING

Theory of Computation

DFA

Lecture No.- 02

By- Venkat-sir

Recap of Previous Lecture

Topic

Topic

Topic

TOC Introduction

Alphabet

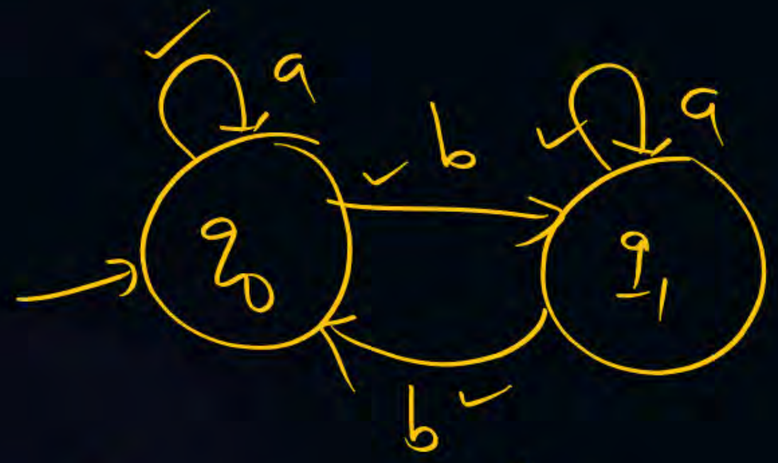
String $\Rightarrow \epsilon$

Language $\Rightarrow$ Empty Language
Finite Language
Infinite Language

DFA $= (Q, \Sigma, q_0, F, S)$ || F.A $\Rightarrow$ DFA

Topics to be Covered

- Topic — DFA Construction
- Topic — ??
- Topic — ??



DFA? $(Q, \Sigma, q_0, F, \delta)$

F : set of final states

$n, m \geq 1$

$L_1 = \{a^n b^m / n > m\} \Rightarrow$ Dependency exist ✗

DFA not possible

$L_2 = \{a^n (b^{2m}) \mid n, m \geq 1\} \Rightarrow$ DFA possible

$a^5 (bb)^m$

L_2: Regular Language?

DFA ⇒ Language

=

#Q. Identify language accepted by given DFA

Set of all strings

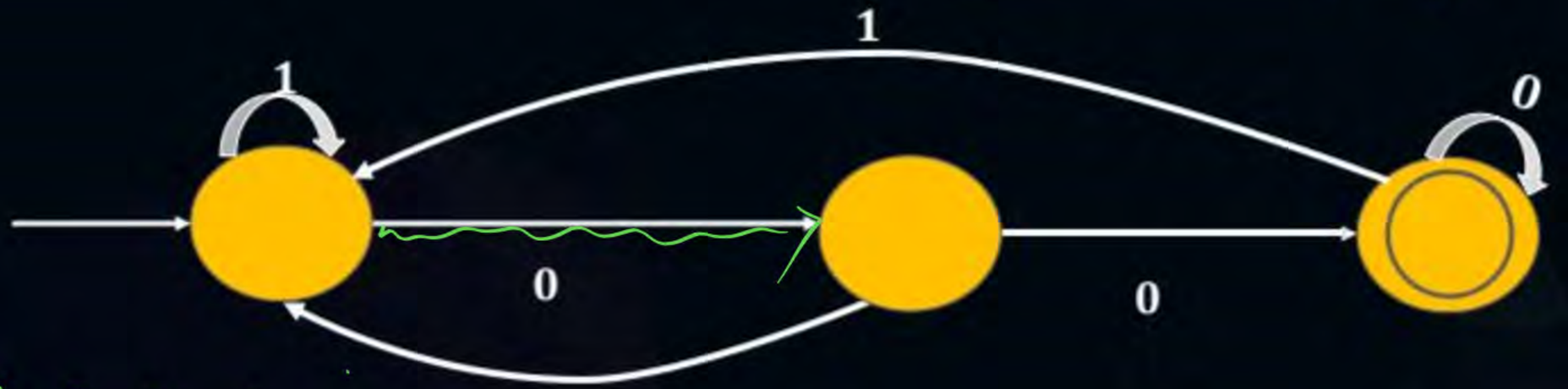
A Starting with bb

B Ending with bb

C Contains atleast 2 b's

D None

#Q. Identify language accepted by following DFA



A Starting with 00

B Substring 00

C Ending with 0

D None

#Q. Identify language accepted by following DFA

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

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

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

D None

#Q. Identify language accepted by following DFA

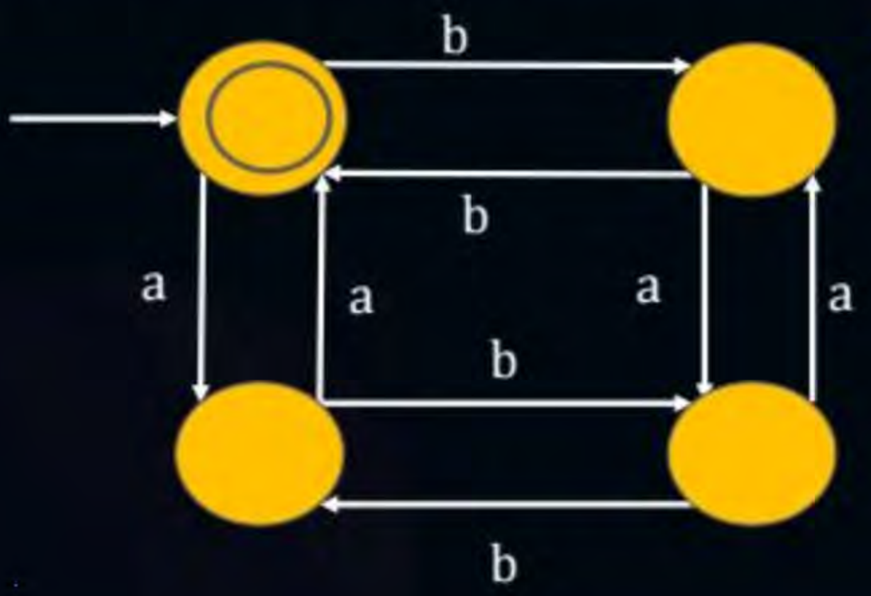
A $L = \{a^n b^m \mid n, m \geq 1\}$

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

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

D None

#Q. Identify language accepted by following DFA



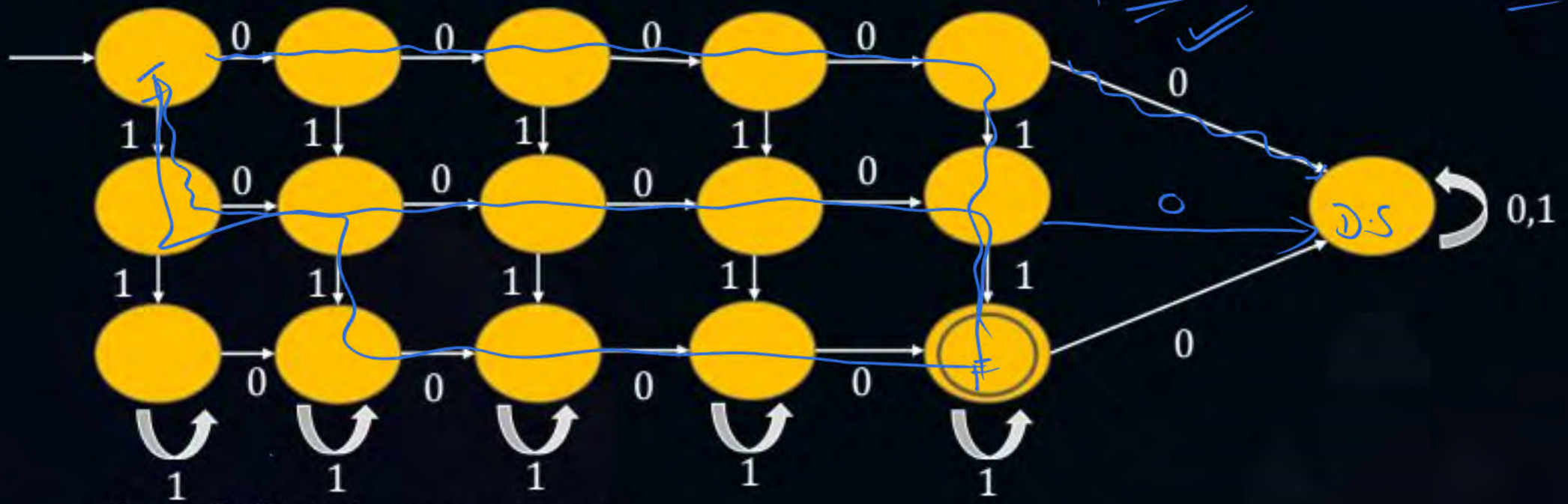
A # a's even and # b's even

B # a's odd and # b's even

C # a's odd and # b's odd

D # a's even and # b's odd

#Q. Identify language accepted by following DFA



Set of all strings contains

A Length of the string alteast 6

B # 0's exactly4 and 1's atleast 3

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

D None

Topic : DFA Construction

Dependency

If(comparision)exist between symbols of language then DFA is not possible.

Topic : DFA Construction

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

Construct DFA for the following Language.

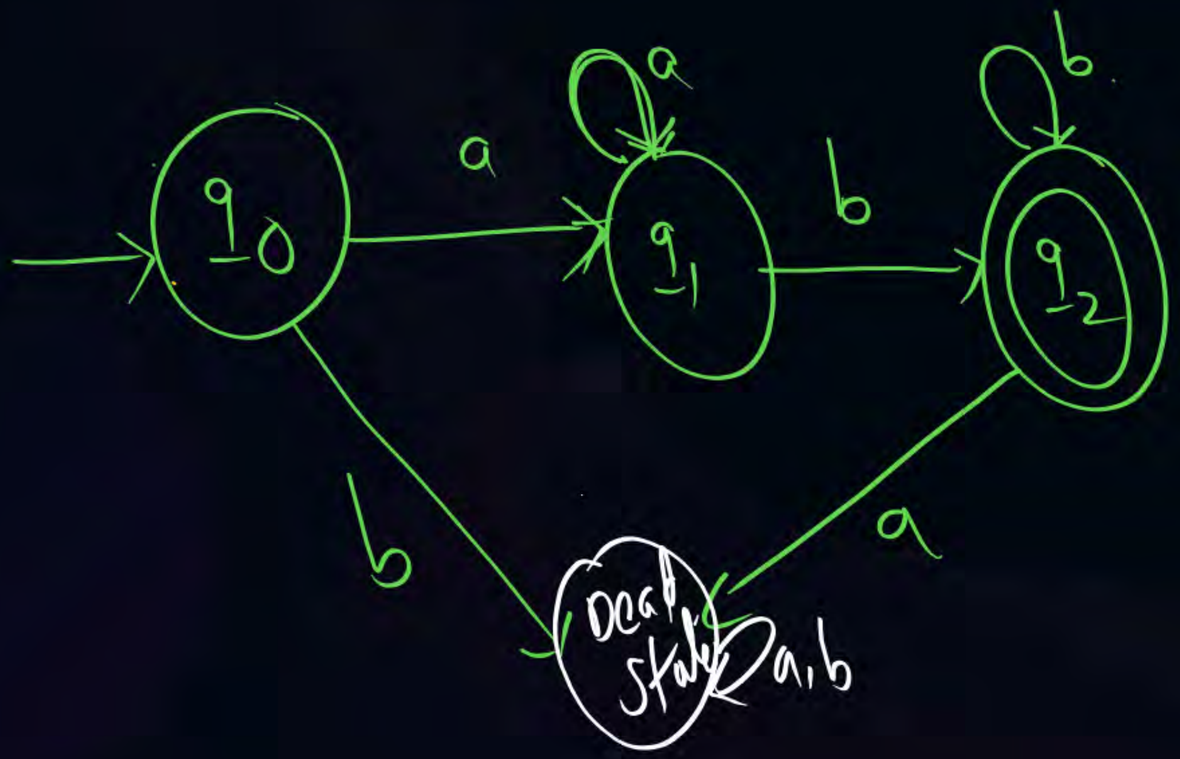
$(Q, \Sigma, q_0, F, \delta)$

a aa ab

a a b

$L = \{ab, a^2b, ab^2, a^2b^2, \ldots\}$

How many states?



4 states

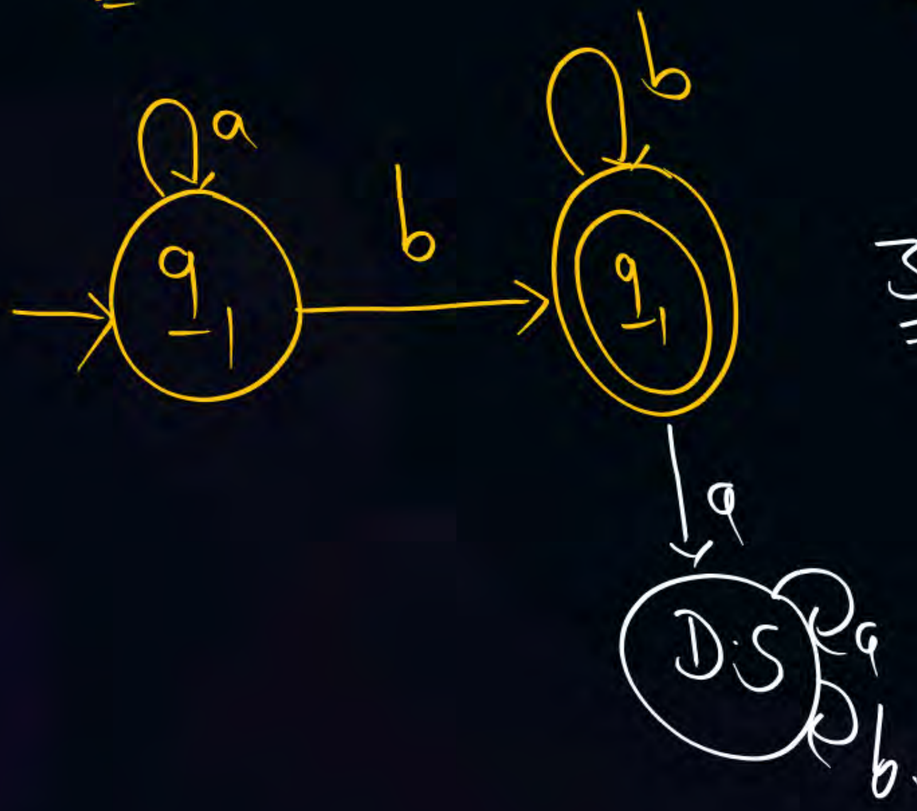
Topic : DFA Construction

$L = \{a^n b^m \mid \begin{matrix} n \geq 0 \\ m \geq 1 \end{matrix}\}$

Construct DFA for the following Language.

$\{b, b^2, b^3 \ldots$
$ab, a^2b, ab^2 \ldots\}$

ab



3 states

Topic : DFA Construction

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

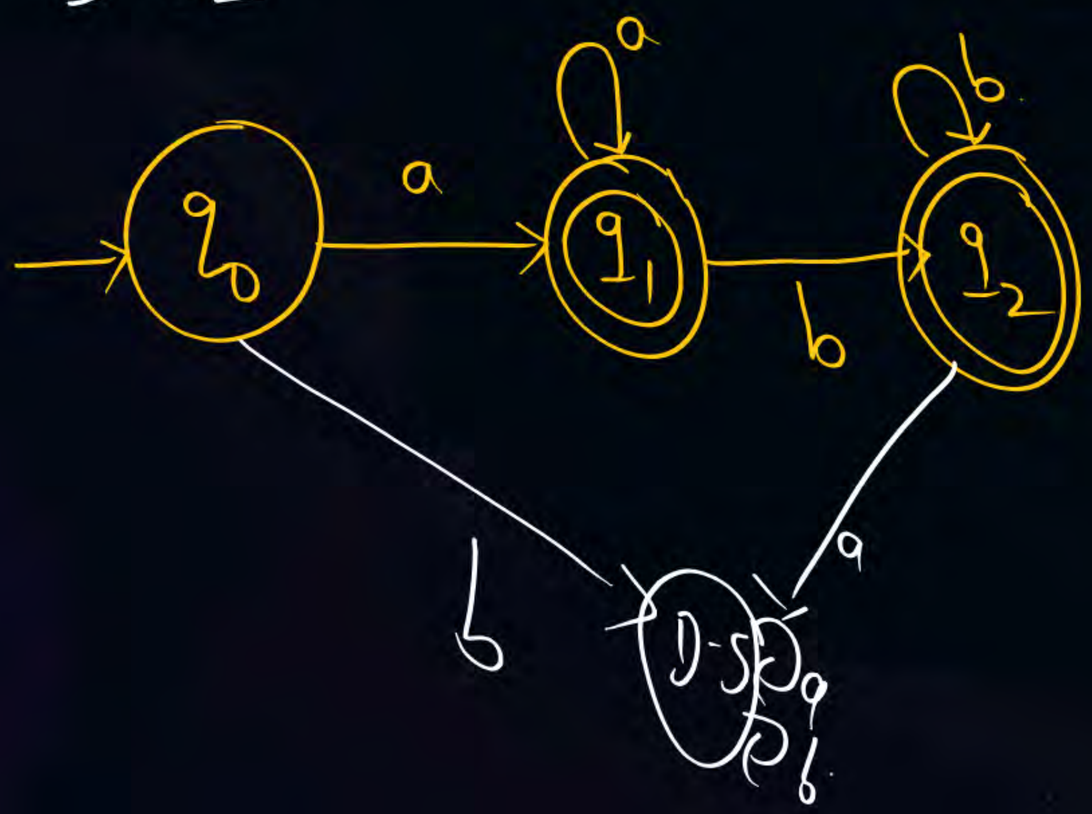
Construct DFA for the following Language.

$\{a, a^2, a^3, a^4 \ldots\}$

$\{ab, a^2b, ab^2, a^2b^2 \ldots\}$

ab aba

4 states



Topic : DFA Construction

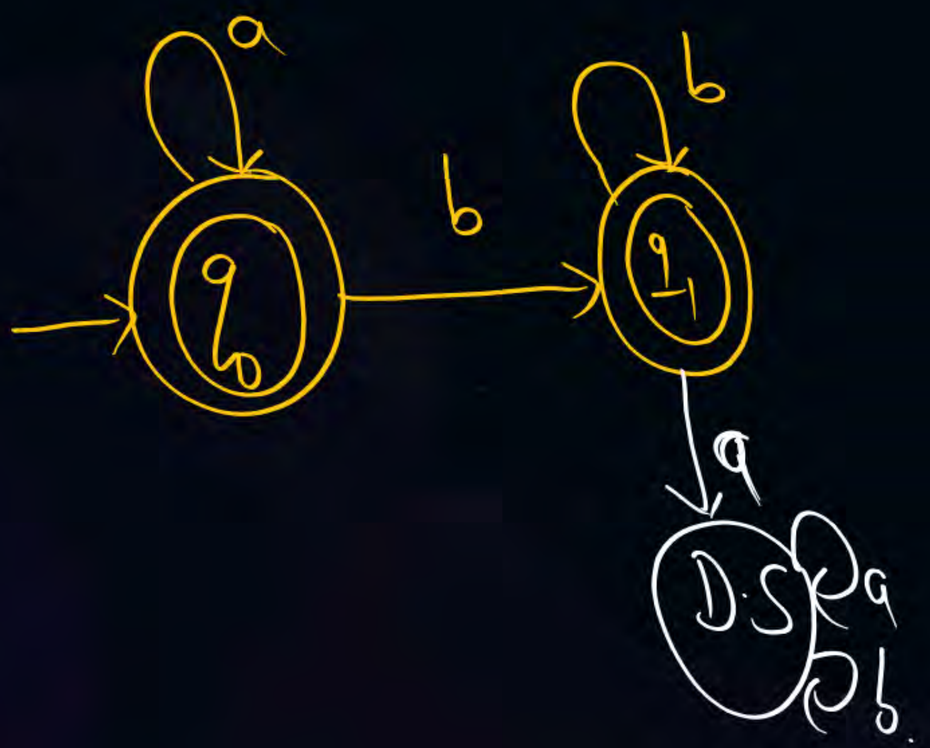
$L = \{a^n b^m / n, m \geq 0\}$

Construct DFA for the following Language.

$\{\epsilon, a, a^2, \ldots, b, b^2, \ldots, ab, ab^2, \ldots\}$

DFA

3 state

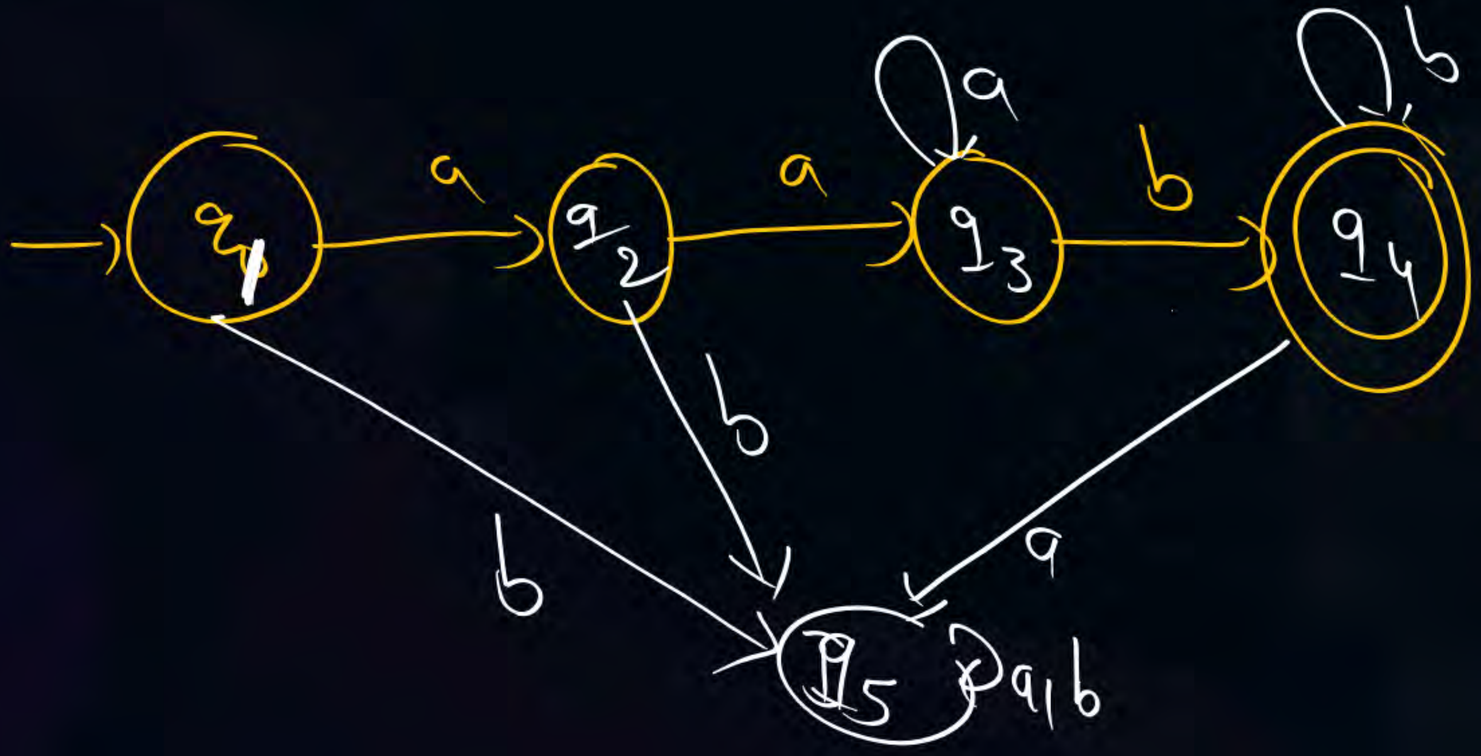


Topic : DFA Construction

Construct DFA for the following Language.

DFA = 5 states

$L = \{a^n b^m \mid n \geq 2, m \geq 1\} = \{a^2 b_1 \ldots\}$



Topic : DFA Construction

Construct DFA for the following Language.

$$L = \{a^{2n} \mid n \geq 1\} = \{a^{3\times}, a^{5\times}, a^{7\times}\} = \{a^2, a^4, a^6 \ldots\}$$

3 states

Topic : DFA Construction

Construct DFA for the following Language.

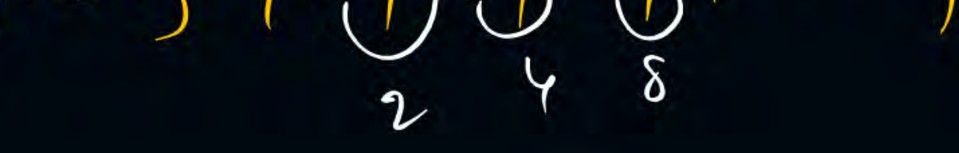
$$L = \{ a^{2^n} \mid n \geq 1 \} = \{ a^2, a^4, a^8, a^{16} \cdots \}$$

(a) 3

(b) 5

(c) 8

(d) none



DFA not possible

Topic : DFA Construction

Construct DFA for the following Language.

NOTE

If a language formed over 1 symbol then common difference should exist between string to Construct DFA

Otherwise DFA not possible.

Q. Which of the following is Regular Language?

(a) $L = \{a^{n^n} \mid n \geq 1\} = \{a^1, a^4, a^{27} \ldots\}$ ✗

(b) $L = \{a^p \mid p \text{ is prime number}\} = \{a^2, a^3, a^5, a^7, a^{11} \ldots\}$ ✗

(c) $L = \{a^k \mid k \text{ is odd number}\} = \{a^1, a^3, a^5, a^7 \ldots\}$

(d) none

(Q) Construct DFA over $\Sigma = \{0, 1\}$ where each string is having substring 01

$L = \{01, 101, 010, 011, 1010, 0011 \ldots\}$

$(0+1)^* 01 (0+1)^*$

001

||

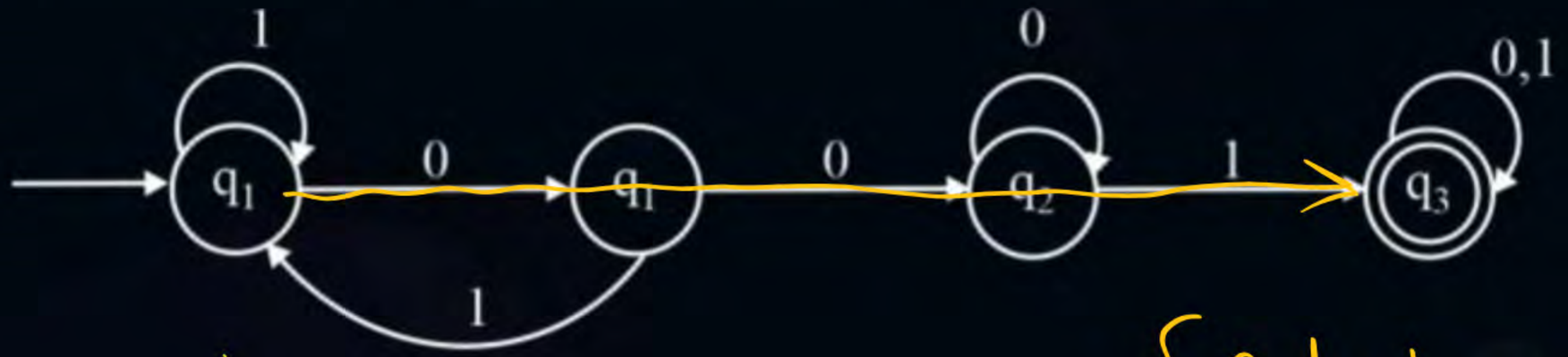
n length substring

||

(n+1) state

MCQ

#Q. Consider the following deterministic finite automata m.



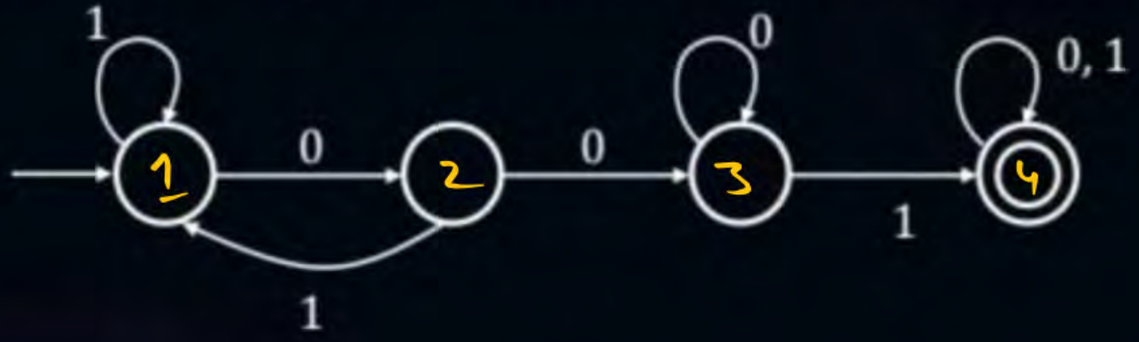
{ Substrings 001 }

The language accepted by finite automata,?

MCQ

#Q. Consider the following deterministic finite state automaton M.

M =



= Sub string 001

Let S denote the set of seven-bit binary strings in which the first, the fourth, and the last bits are 1. The number of strings in S that are accepted by M is

S: 1 00 1 00 1 } 16

(11) (10) (11)

A 1

B 5

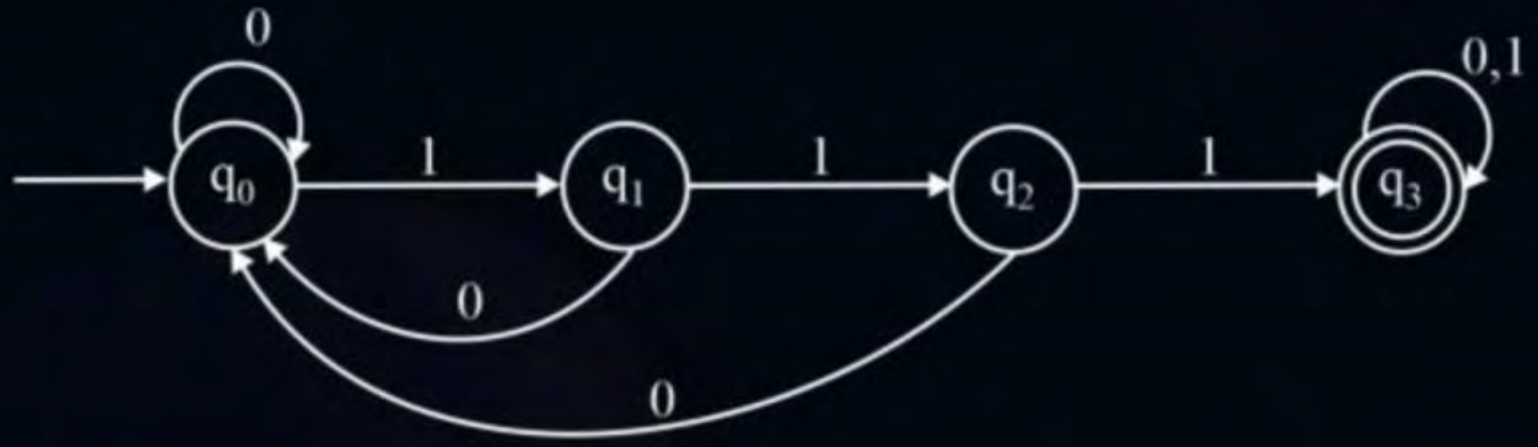
C 7

D 8


00 00
00 01
00 10
00 11
01 00
5
01 01
01 10
01 11
10 00
10 01
10 10
10 11
6
11 00
11 01
11 10
11 11
7

MCQ

#Q. Consider the finite automata m.



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

A The set of all strings containing three consecutive I's

B The set of all strings not containing three consecutive I's

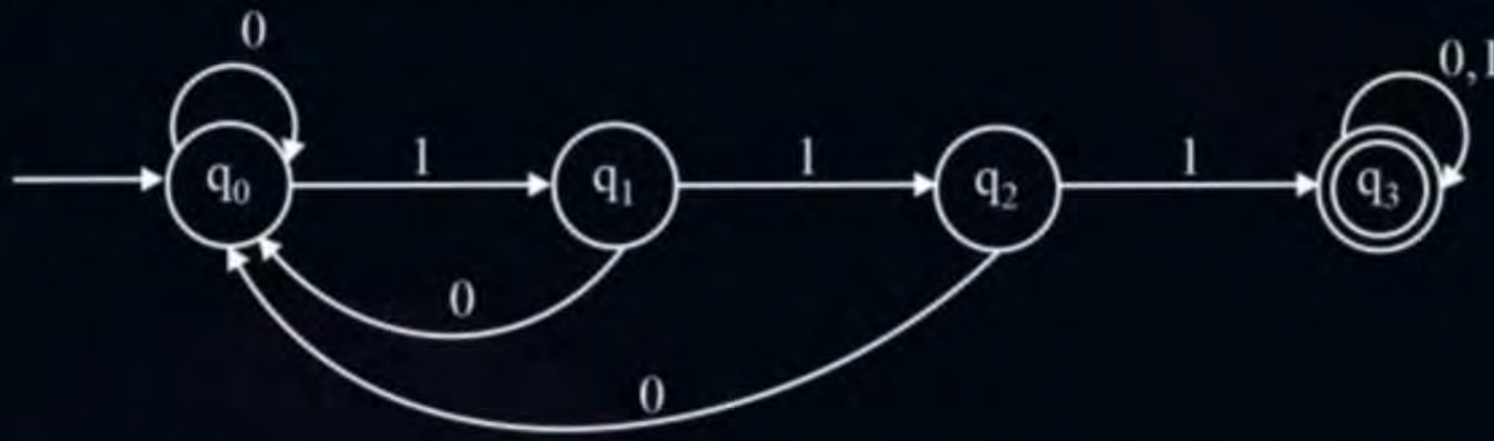
C The set of all strings beginnigs with three consecutive I's

D The set of all strings ending with three consecutive I's

MCQ

#Q. Consider the finite automata m.

m =



= Language = ?

Substring !!!

Home work

Let S denotes the set of all six bit binary strings in which first and fourth bits are 1. The number of strings in S that are accepted by m is-

S: 1 _ _ 1 _ _

4+1+2+1

8

A	1	B	4
C	7	D	8

THANK - YOU