CS & IT ENGINEERING

THEORY OF COMPUTATION

REGULAR EXPRESSION

Lecture No.- 04

By- Venkat sir

Recap of Previous Lecture

Topic ?????

Properties of Regular Expression

Finite Automata ⇒ Regular Expression

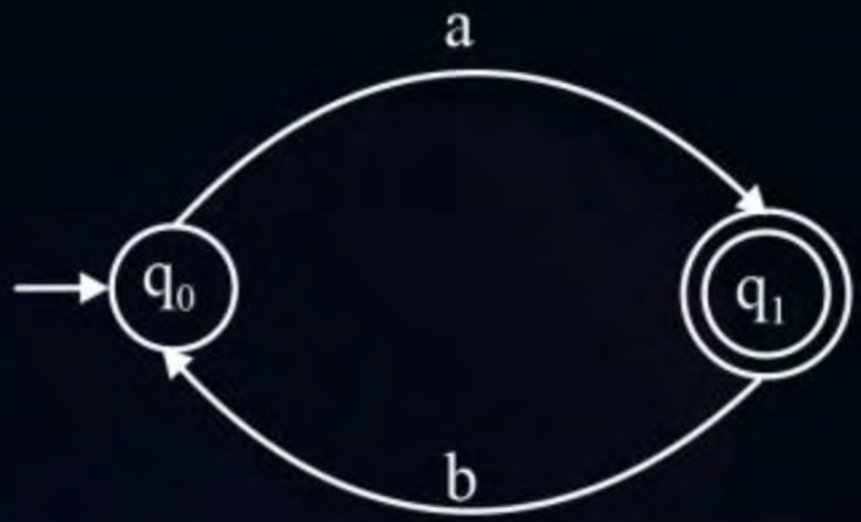
Topics to be Covered

- Topic
- Topic ??
- Topic ??
- Topic ??

F. A ⇒ Regular Expression

Regular Expression ⇒ Finite Automata

5.



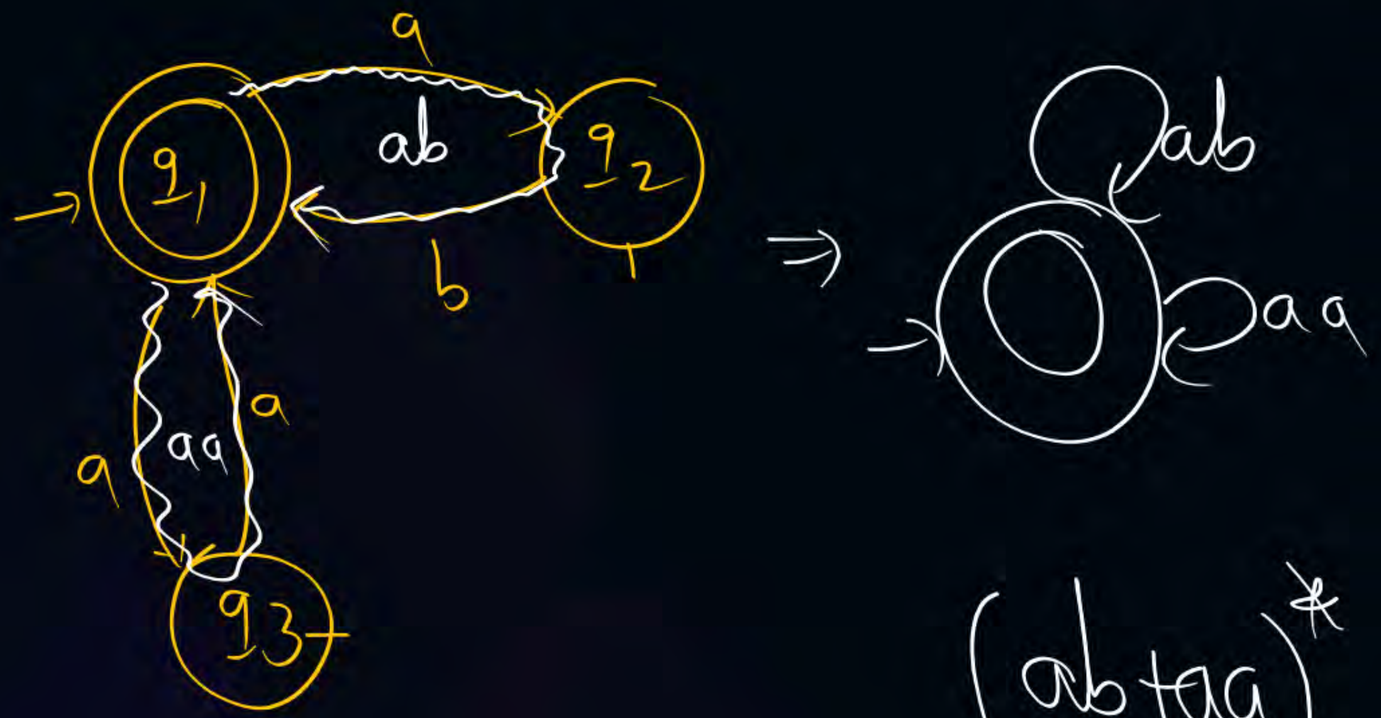
[NAT]

#Q. Construct Regular Expression for the following Finite Automata.

$$\{(b+ba)^*\}$$

[NAT]

#Q. Construct Regular Expression for the following Finite Automata.

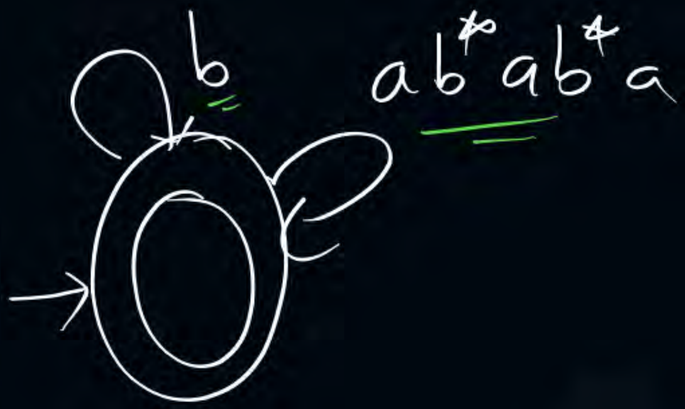


$$(ab + aa)^*$$

[NAT]

#Q. Construct Regular Expression for the following Finite Automata.

$\Rightarrow$

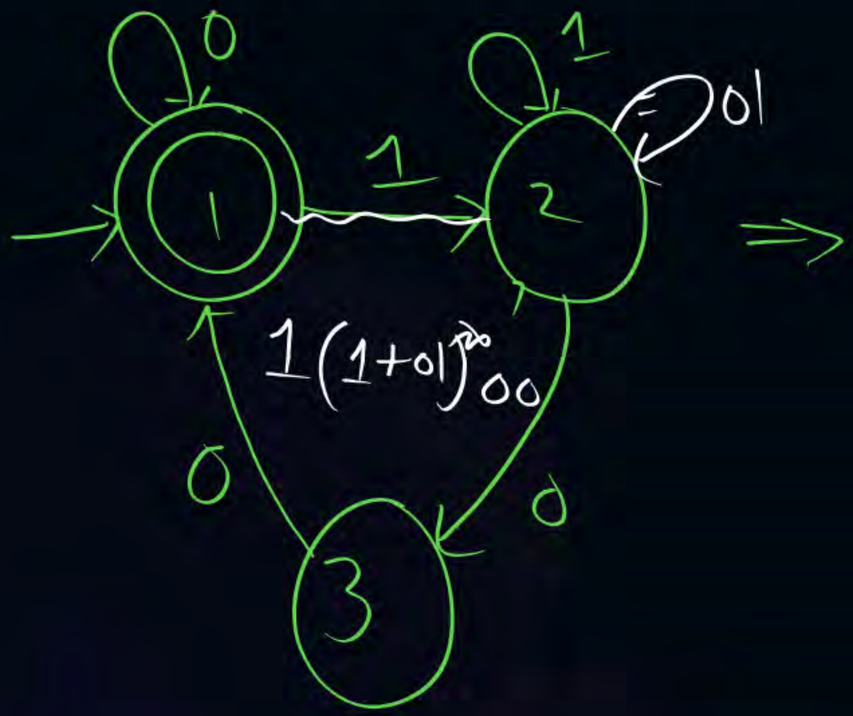


$$(b+ab^*ab^*a)^*$$

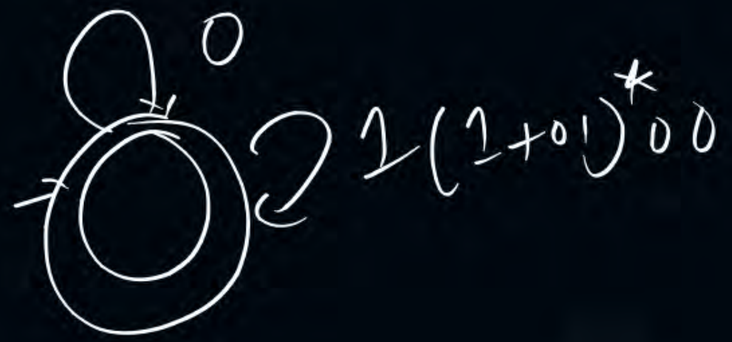
[NAT]

$(a+b)^* \neq a^* + b^*$

#Q. Construct Regular Expression for the following Finite Automata.



$$\Rightarrow$$



$$\left(0 + 1(1+01)^*00\right)^*$$

[NAT]

#Q. Construct Regular Expression for the following Finite Automata.

$a^* b^+$

$a^* b^*$

$a^* b b^* + a^*$

$a^* (b^+ + \epsilon)$

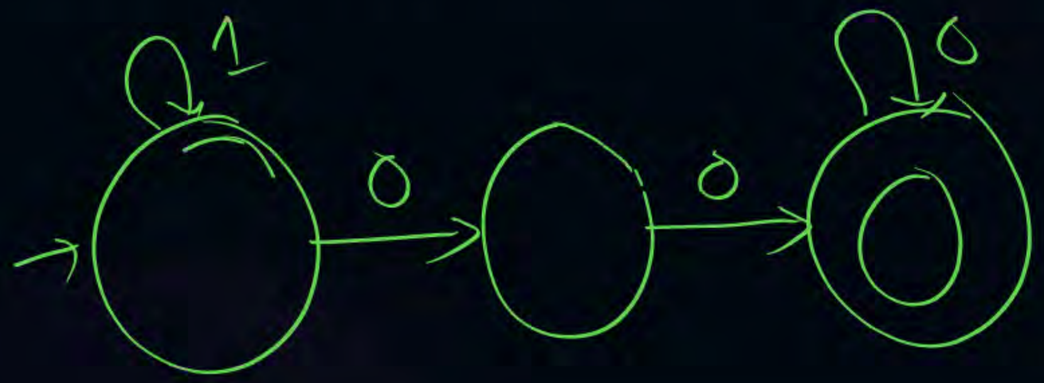
$a^* b^*$

[NAT]

#Q. Construct Regular Expression for the following Finite Automata.

[NAT]

#Q. Construct Regular Expression for the following Finite Automata.

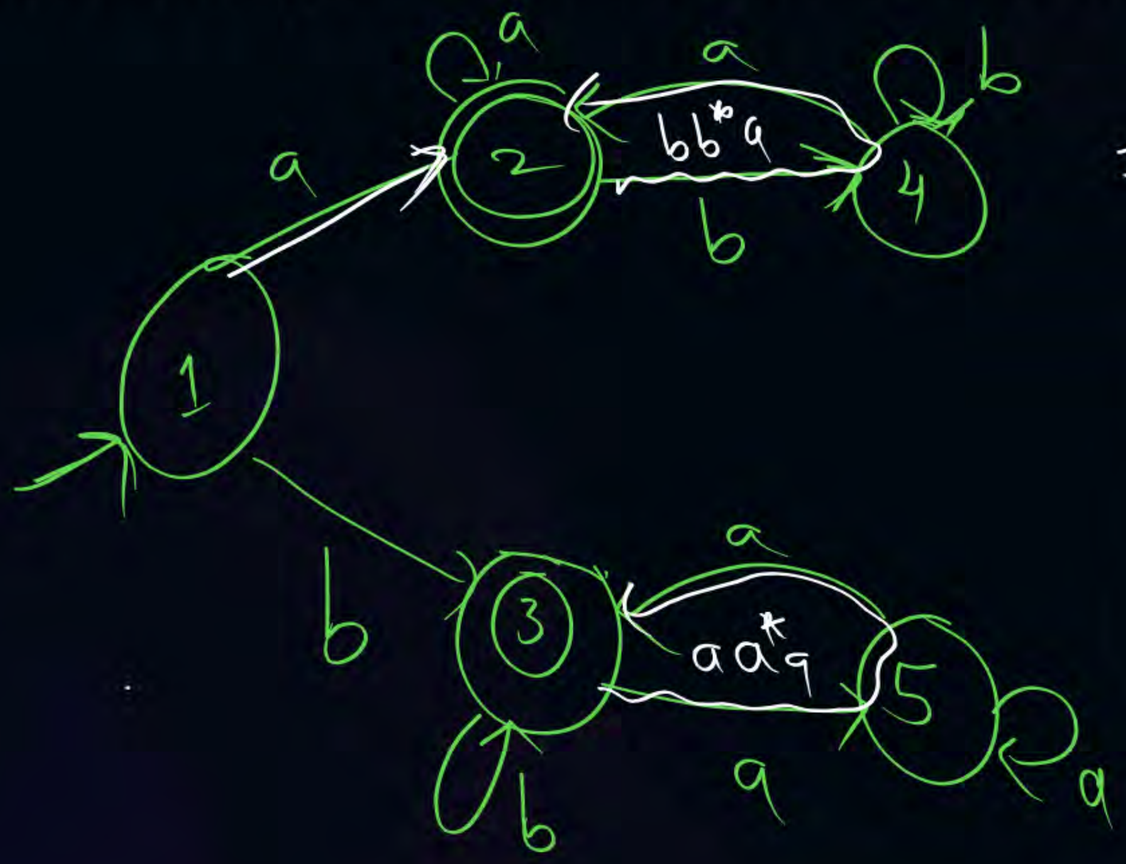


$$1^* + 1^*0 + 1^*000^*$$

$$1^*(\epsilon + 0 + 000^*) = 1^*0^*$$

[NAT]

#Q. Construct Regular Expression for the following Finite Automata.



$$\Rightarrow a(a+bb^*a)^* + b(b+aa^*a)^*$$

Regular Expression

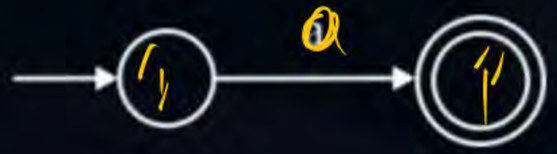
Finite Automata

DFA X

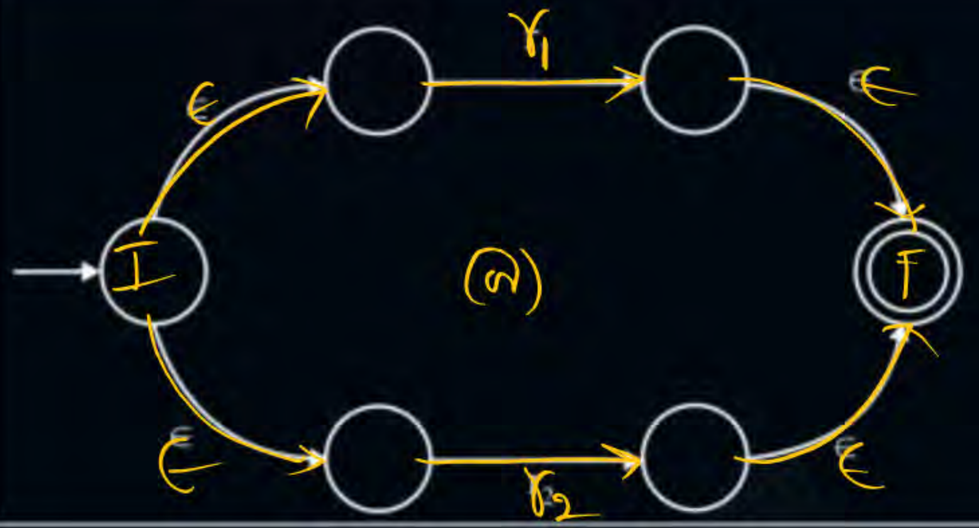
NFA X

ε-NFA

Thomson Construction

Reg. Expr	∈-NFA
1. ϕ	
2. $\in$	
3. a	

Union

4. $r_1 + r_2$	
5. $r_1 \cdot r_2$	
6. r^*	

[NAT]

#Q. Construct ε-NFA for the following Regular Expression

$(ac+b)\cdot b\cdot a^*$ ✓

[NAT]

#Q. Construct NFA for the following Regular Expression

[NAT]

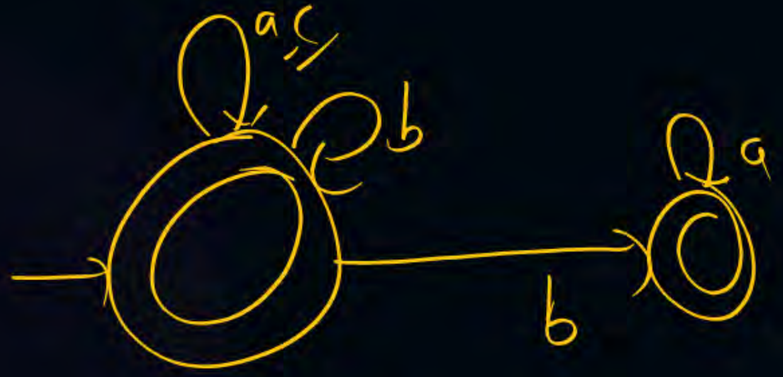
#Q. Construct NFA for the following Regular Expression

$$(a+b)^* a\, b^* a (a+b)^* b\, a^*$$

[NAT]

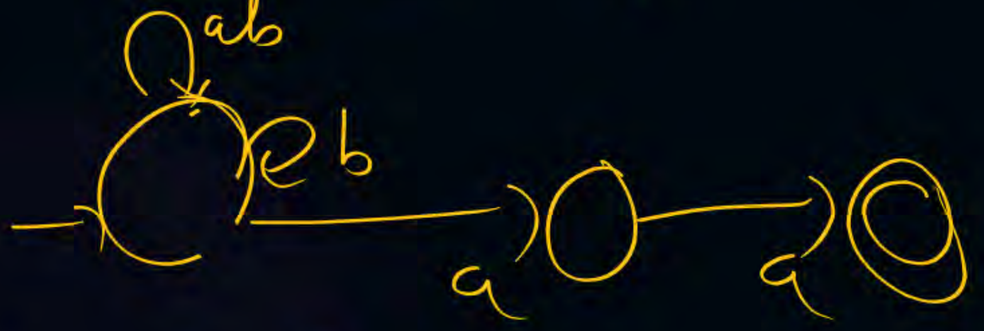
#Q. Construct NFA for the following Regular Expression

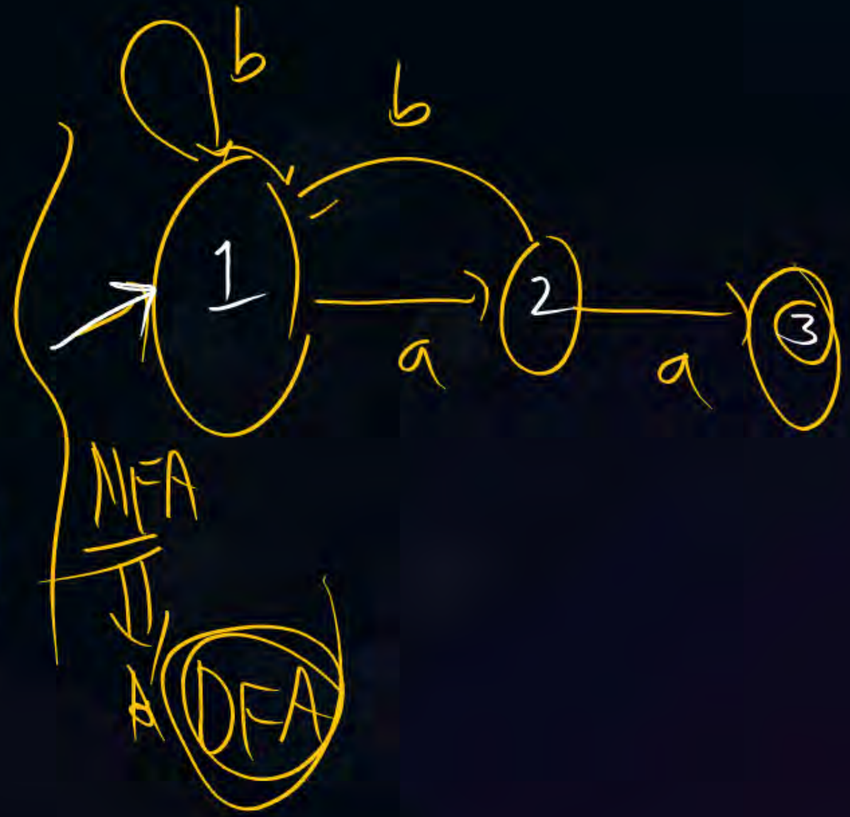
$(a+b)^* b a^*$



NFA

$(ab+b)^*aa$ } NFA states ?

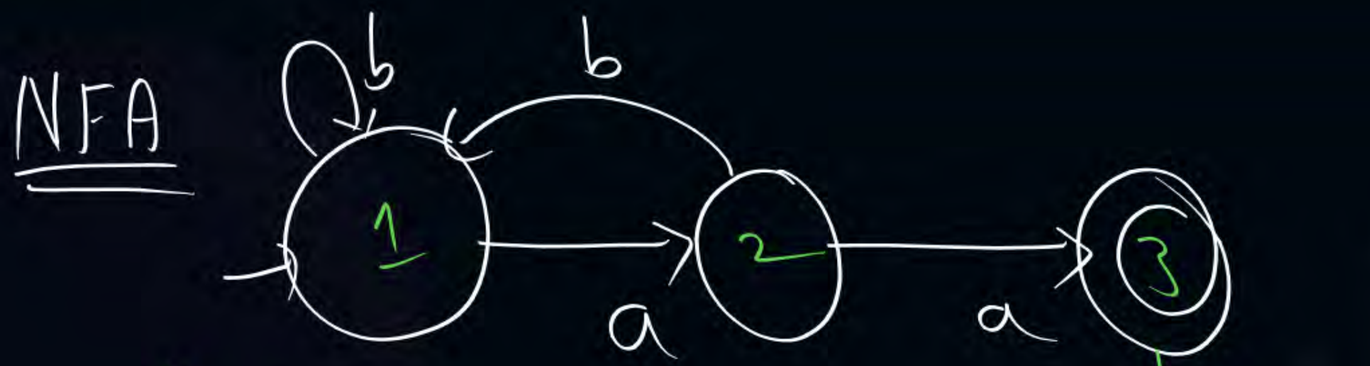




[NAT]

#Q. Construct DFA for the following Regular Expression

$(ab+b)^* aa$



DFA ⇒

4 States

[NAT]

#Q. Construct DFA for the following Regular Expression

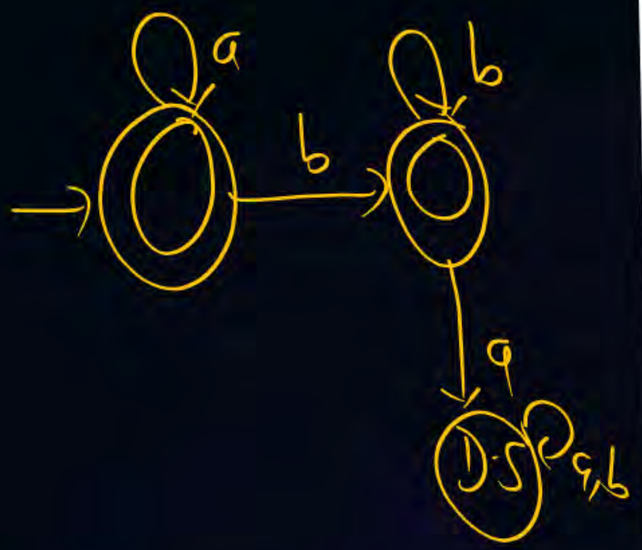
5 States

[NAT]

{a^n b^m / n,m ≥ 0} ∈ ?

#Q. Construct DFA for the following Regular Expression

$a^* b^*$



3

$a^* b^* c^*$

4

$a^* b^* c^* d^*$

5

$a^* b^* c^* \cdots z^*$

27 state

$\{0^* 1^* 2^* \cdots 9^*\}$

11

[NAT]

#Q. Construct min DFA for the following Regular Expression

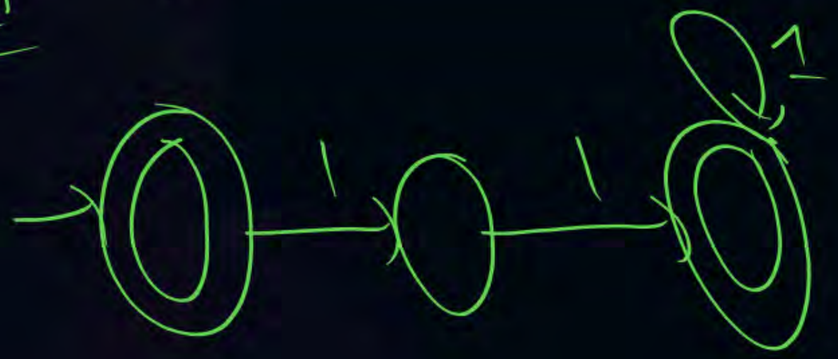
$(r_1 + r_2)^*$ $\Sigma = \{1\}$

$\{r = (11 + 111)^*\}$

$\{\epsilon, 1^2, 1^3, 1^4, 1^5, 1^6 \ldots\}$

0 (1) x

min DFA



[NAT]

#Q. Construct DFA for the following Regular Expression

min DFA

① $(a+b)(a+b)(a+b)$ → exactly $(n+2)$ → 5 states

② $(a+b+\epsilon)^4$ → atmost 4 → 6

③ $((a+b)^n)^*$ → Div by n → n states

④ $(a+b)^* abab (a+b)^*$ → Sub string $(n+1)$ → 5 states

[NAT]

#Q. Construct min DFA for the following Regular Expression

$$(a+b)^* \; a \; (a+b)(a+b)$$

3 2 1

R.H.S

$(2^n) \Rightarrow 2^3 = 8$ states

[NAT]

#Q. Construct min DFA for the following Regular Expression

$$r = (111 + 11111)^*$$

Home Work

2 mins Summary

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

① Reg Expr Construction

② Properties

③ F.A $\rightleftharpoons$ Reg Expr

THANK - YOU