ID# 13794 (1) 24/06/20

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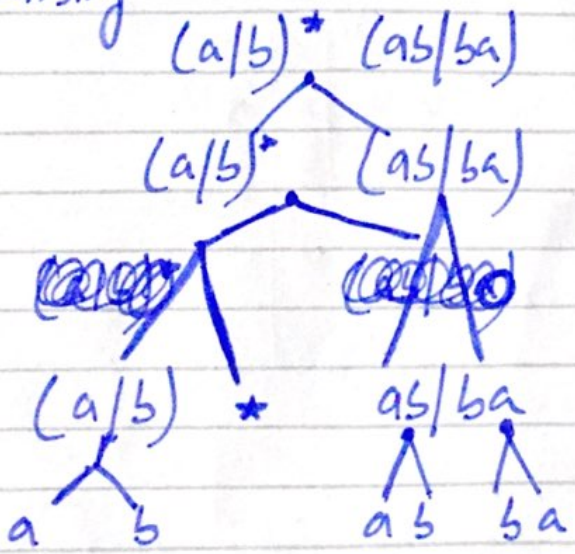
THEORY of AUTOMATA

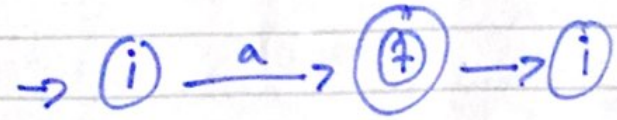
Q1) Parse the given RE into its individual / Atomic symbols and then design an NFA.

$$(a/b)^*(ab/ba)$$

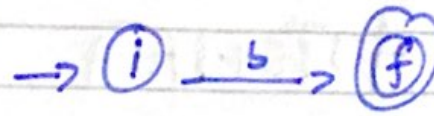
Sol:- parsing



=> NFA for A3 a;

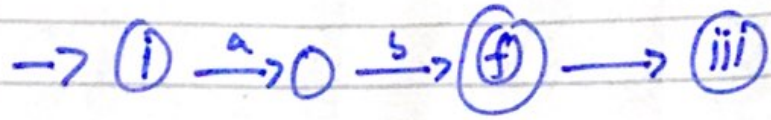


⇒ NFA for A, B;

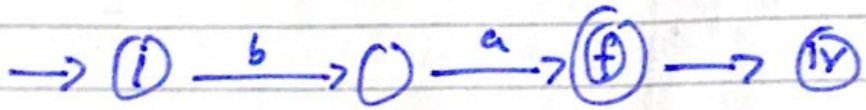


Now, NFA for ab;

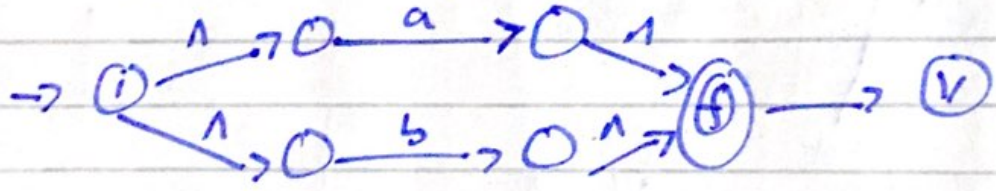
Combine (i) & (ii)



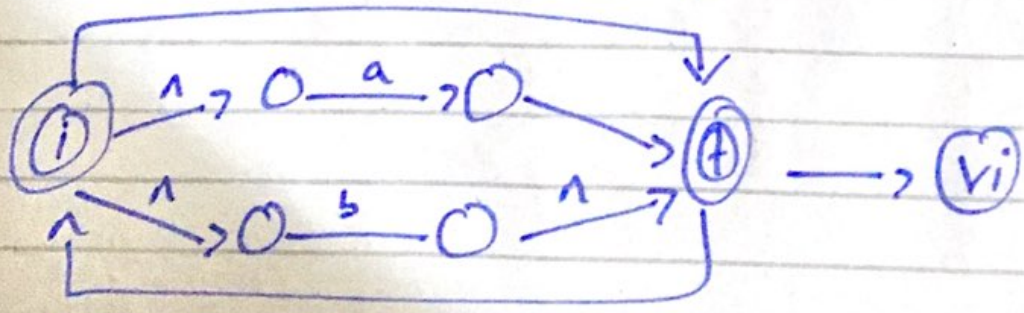
⇒ Now NFA for ba;



Now, NFA for a/b.

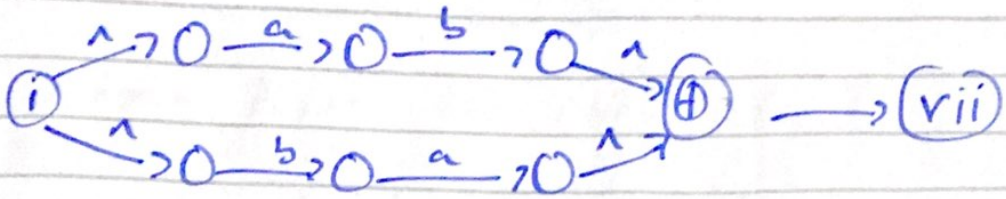


⇒ Now, NFA for (a/b)*

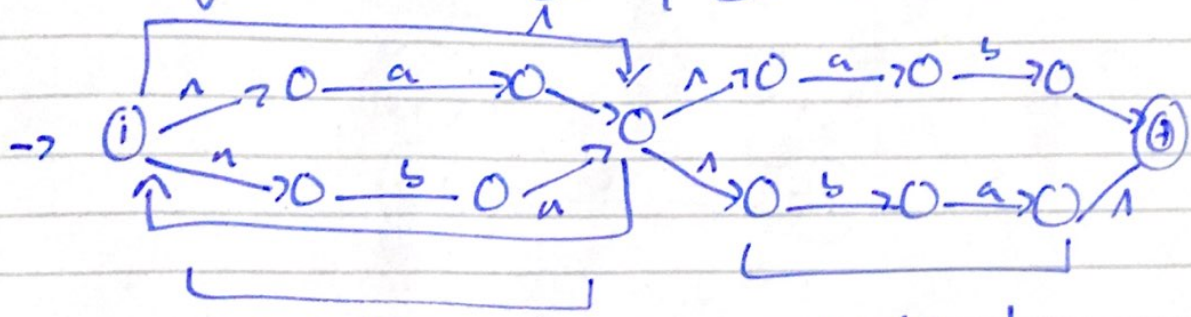


Now NfA for (ab/ba)

combining (iii) & (ix)



⇒ Major NfA (vi) & (vii)



(4)

d 3) Prove that

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

SOL: For a^*b^*

$a^0b^0 = 1 = \lambda$

$a^1b^0 = a$

$a^1b^1 = ab$

$a^0b^1 = b$

$a^*b^* = \{\lambda, a, ab, b, ba \ldots\}$

For $(a|b)^*$

$(a|b)^0 = \lambda$

$(a|b)^1 = a$ or b a, b

$(a|b)^2 = aa, ab, ba, bb \ldots$

SO

$(a|b)^* = (\lambda, a, b, aa, ab \ldots)$,

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①

that

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

Any

(5)

Q2) Design RE for each of the following.

i) RE for all the optional - - -

Sol: $(a+b)^*$

ii) RE - - - - .

Sol: $(aa+b)^*$

iii) RE for - - ——— -

Sol: $(aaa+b)^*$

iv) RE for all —— .

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

v) RE for all - - - .

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

Q35) Derive language descriptions (Statements) for the following RE

Sol: i) $(a|b)\ (a|b)\ b(a|b)^*$

Language for words over $\{a, b\}$ which starts with 'aa' or 'ba' or 'bb' followed by b and ends with any letter.

ii) $(a|b)^*\ b\ (a|b)\ (a|b)$

$L = \{a, b\}$ where string starts with any letter followed by 'b' & ends with 'aa' or 'ab' or 'ba' or 'bb'.

iii) $(a|b)^*\ (aa|bb)$

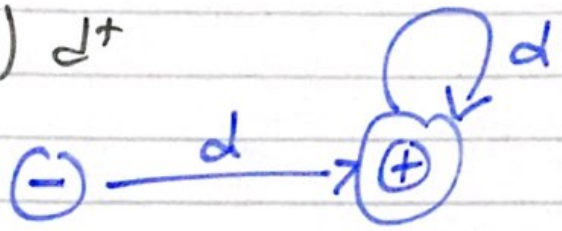
Sol: $L = \{a, b\}$ where last symbol must be two 'aa' or two 'b's
string must end with 'aa' or 'bb'

iv) $(aa/bb)(a/b)^*$

$L = \{a, b\}$ where first symbol must be aa or bb String must start with 'ac' or 'bb'.

Q4) Design NFA

i) $(+/-)\,d^+$



ii) $(a/b)^*(aaa/bbb)(a/b)^+$