

Date: 25/6/20

(1)

ID No

13943

Name

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Subject

Theory of Automata

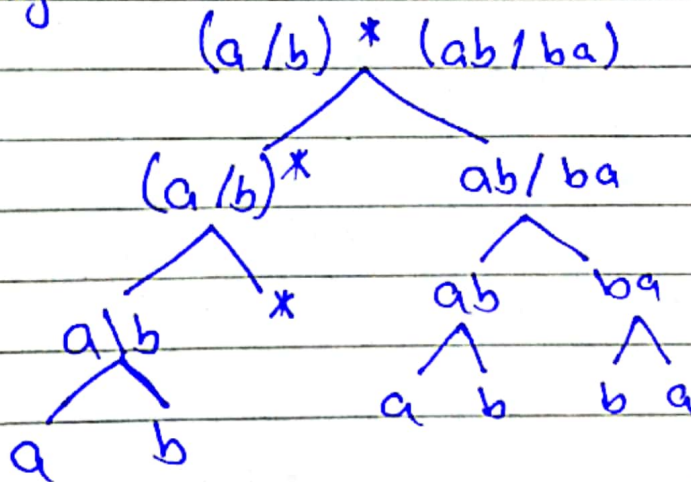
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Question 1:

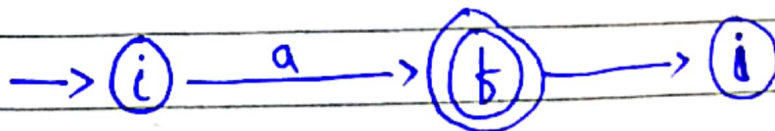
Answer:

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

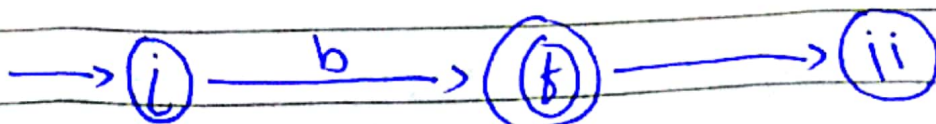
Parsing



NFA for A's a;



NFA for A's b;

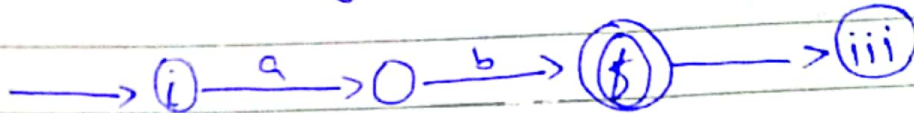


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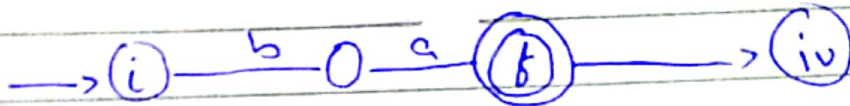
(2)

Now NFA for ab

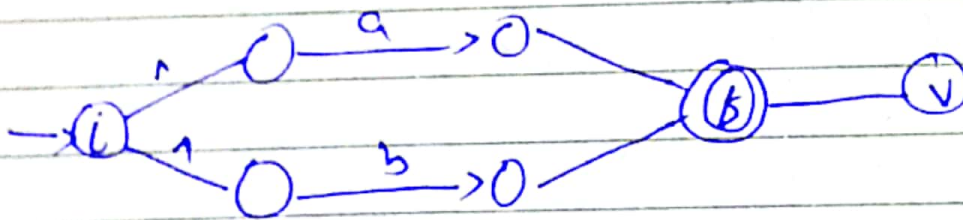
Combining (i) & (ii)



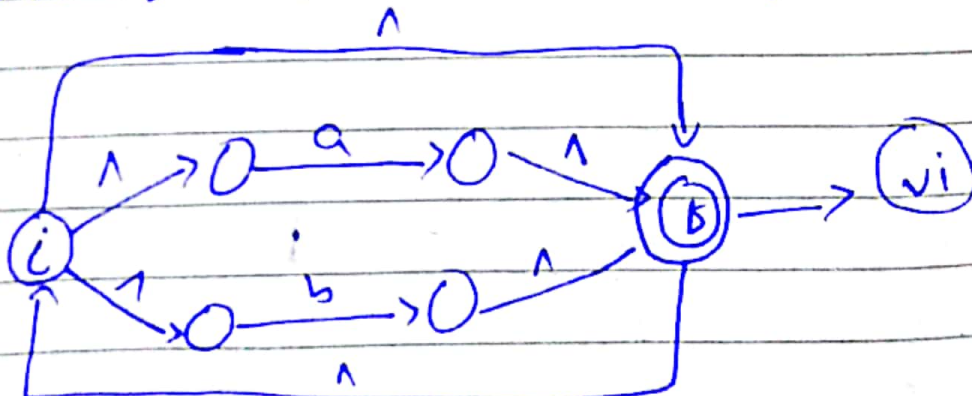
Now NFA for ba



Now NFA for a|b:



Now ~~for~~ NFA for  $(a|b)^*$

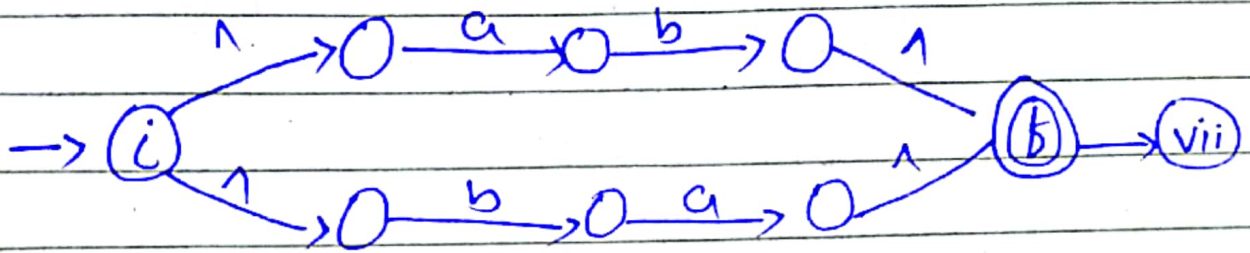


Now NFA for  $(ab|ba)$

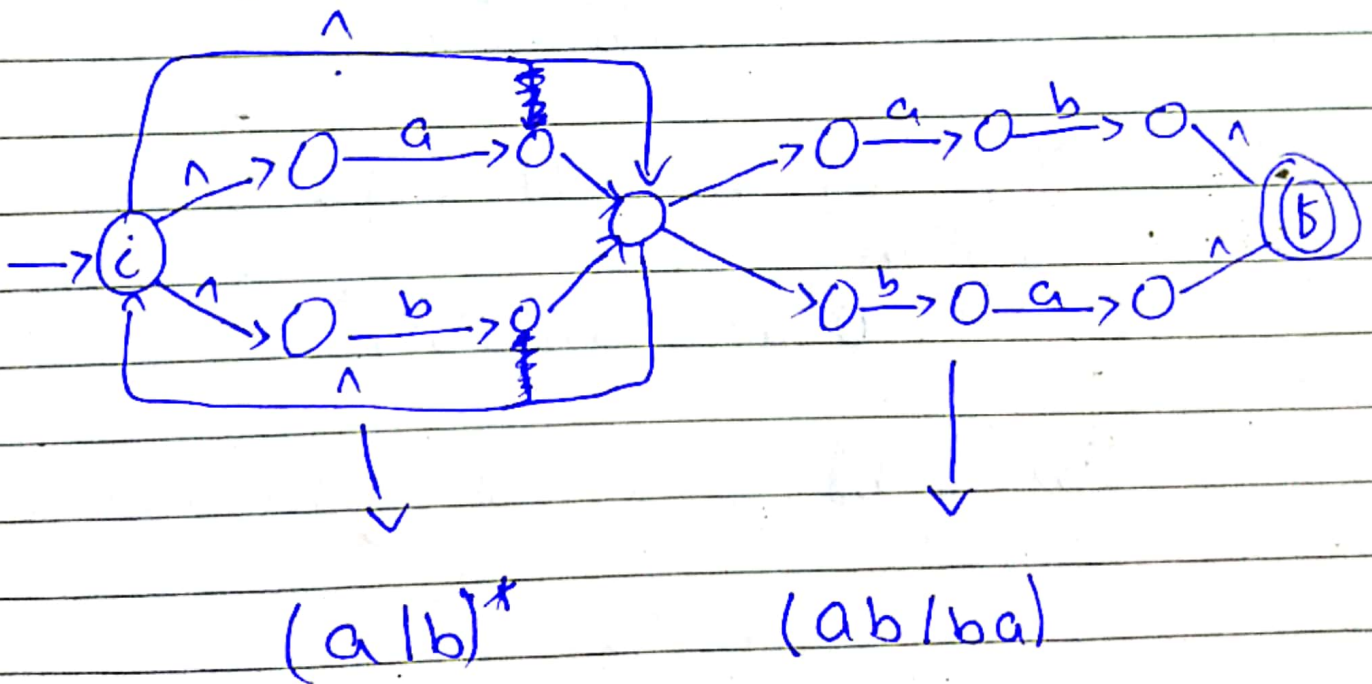
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Combining (iii) and (iv)



Major NFA (vi) and (vii)



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(4)

Question 9:

Answer:

(i) RE for word over  $\{a, b\}$

Solution:

$$(a/b)^*$$

(ii)  $\{a, b\}$  with even number of "a"

solution

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

(iii)  $\{a, b\}$  with odd number of "a"

solution

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

(iv)  $\{a, b\}$  where last symbol must be "b"

solution

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

(v)  $\{a, b\}$  where first symbol must be "b"

solution:

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

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Question 3:

Answer:

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

for

$$a^* b^*$$

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

$$a^1 b^0 = a$$

$$a^1 b^1 = ab$$

$$a^0 b^1 = b$$

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

for

$$(a/b)^*$$

$$(a/b)^0 = \Lambda$$

$$(a/b)^1 = a, b, a \text{ or } b$$

$$(a/b)^2 = aa, ab, ba, bb, \dots$$

so

$$(a/b)^* = \{\Lambda, a, b, aa, ab, ba, bb, \dots\}$$

So from the final result we conclude that

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

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Question 3:

(b):

(i)  $(a/b)(a/b)b(a/b)^*$

Language for words over  $\{a, b\}$  which starts with "aa", "ab", "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" and ends with aa, ab, ba, bb.

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

$L = \{a, b\}$  where last symbol must be two a's or two b's.

String must end with "aa" or "bb"

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

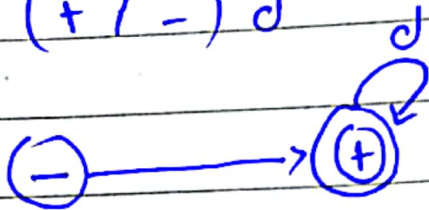
$L = \{a, b\}$  where first symbol must be aa or bb string must start with "aa" or "bb"

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Question 4:

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



(ii)

$(a/b)^* (aac/bbb) (a/b)^*$

