ASSIGNMENT # 1
THEORY OF AUTOMATA

30

QUESTION NO. 1

(a)

Provide a recursive def of lang having all strings with len multiple of 2 ($\Sigma = \{a, b\}$)

(1) λ, aa, ab, ba, bb are in the language.

(2) If x and y are in the language then xx, xy, yx and yy are also in language.

(3) No strings, except those mentioned above are part of the language.

(b)

Recursive def of odd Palindrome. ($\Sigma = \{a, b\}$).

(1) a, b are in language

(2) If x is in language, then axa and bxb are also in language.

(3) No strings, except those mentioned above are part of language.

(c)

Recursive def.... every string start/end at same double letter. ($\Sigma = \{a, b\}$)

(1) aaaa, bbbb are in the language.

(2) 'aaxaa' and 'bbxbb' are part of language where $x \in \Sigma^*$ and $\Sigma = \{a, b\}$.

3. No strings, except those mentioned above are part of the language.

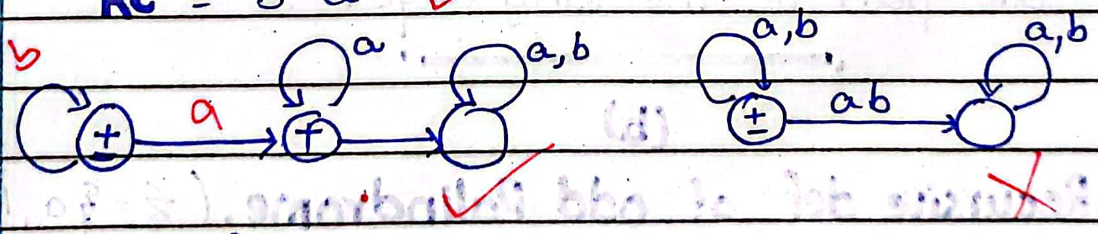
QUESTION . NO . 2

- **Write an RE, Design FA, Design TG (if FA is valid).**

(1)

All words that dont have 'ab'

RE = $b^* a^*$

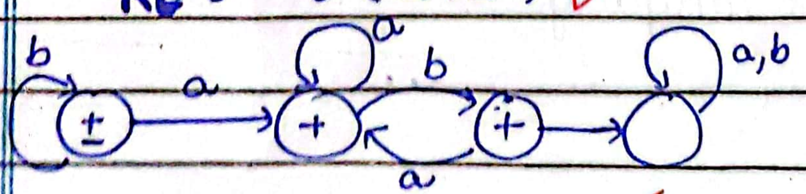


FA TG

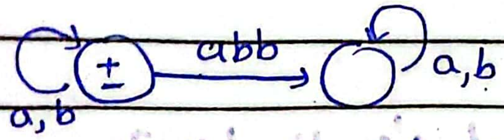
(2)

All strings that don't have 'abb'

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



FA

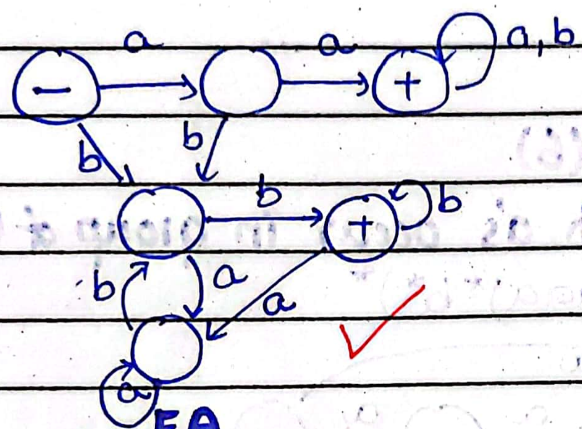


TG

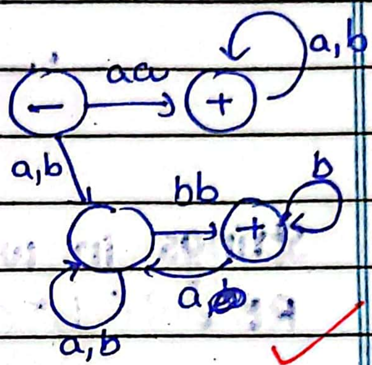
(3)

All words that start with aa and end bb

RE: $aa(a+b)^* + (a+b)^* bb$



FA

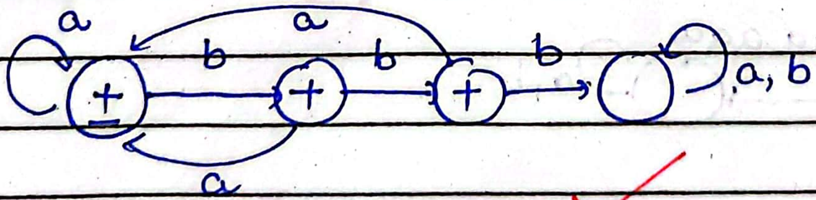


TG

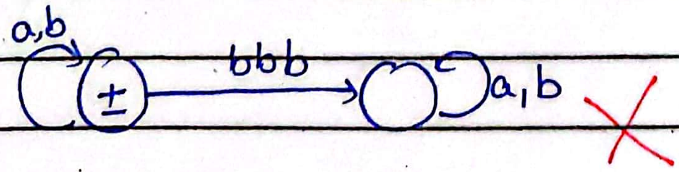
(4)

All words where b not trippled means no 'bbb'

RE: $(a+ba+bba)^*(\lambda+b+bb)$



FA



TG

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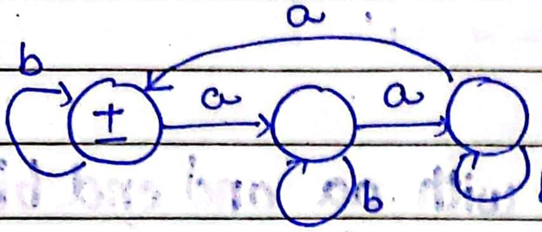
(5)

Words in which num of a's div by 3

RE = $(b^*(ab^*ab^*a)^*b^*)^*$

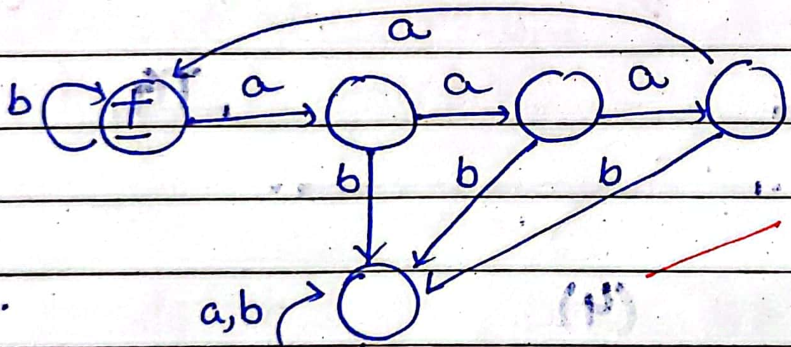


FA = TG

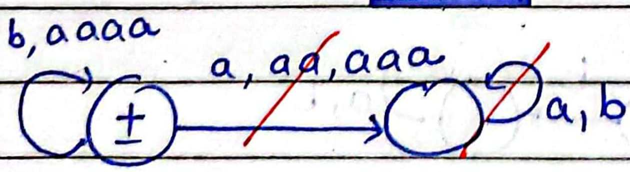
(6)

Strings in which a's occur in group of 4

RE = $b^*(b^*(aaaa)^*b^*)^*$



FA

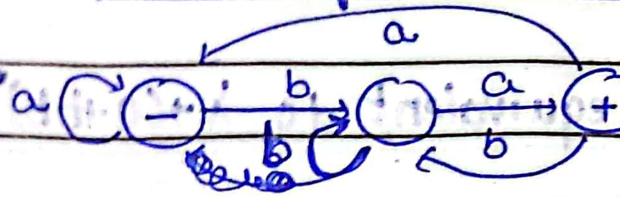


TG

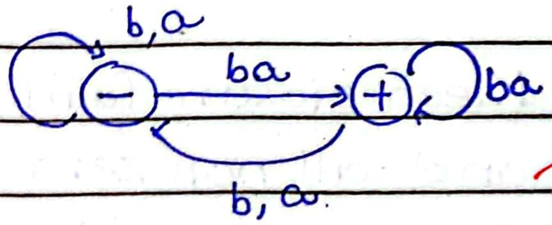
(7):

All Strings that end with 'ba'

RE: $(a+b)^*ba$



FA



6

TG

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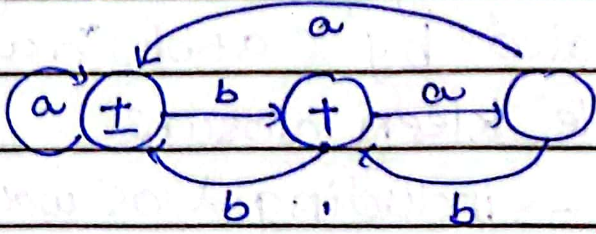
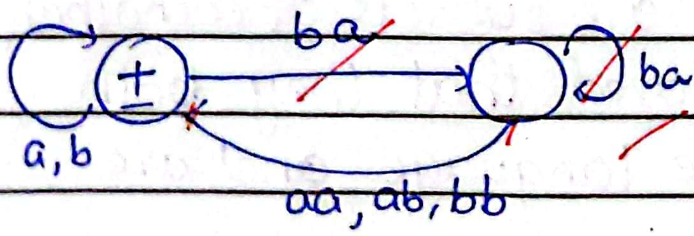
(8)

Strings that never end on 'ba'

RE: $(a+b)^*(aa+ab+bb)+(a^*+b^*)$



FA



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TG

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QUESTION. NO: 3

(a)

$((a+bb)^*aa)^*$ is equivalent to $\lambda+(a+bb)^*aa$ ....

Answer: $((a+bb)^*aa)^* \sqsubseteq \lambda+(a+bb)^*aa$

This is true because the Kleen closure fulfills the λ requirement and all non-zero length strings contain an even number of b's and end in 'aa'. Hence every string generated by $((a+bb)^*aa)^*$ is a factor of and exists in $\lambda+(a+bb)^*aa$

$\lambda+(a+bb)^*aa \sqsubseteq ((a+bb)^*aa)^*$

This is true because every possible string combination generated by $(a+bb)^*aa$ exists in the whole kleen closure of this expression - including λ as well, $\lambda+(a+bb)^*aa$ is a factor $((a+b)^*aa)^*$ itself.

Since both RE's are subsets of eachother, it can be declared that they both define the same language and are equivalent.

DATE: __/__/____

(b)

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

This R.E contains following words:

(1) Starting with a, ending with ~~with~~ b.

(2) any number of a's or ba's in between.

(3) No double b's occur.

$aa^*b(aa^*b)^*$:

This R.E contains following words:

(1) Starting with a, ending with b.

(2) any numbers of a's or ba's in between

(3) No double b's occur

As both R.E define same words (valid) they are equivalent to each other.