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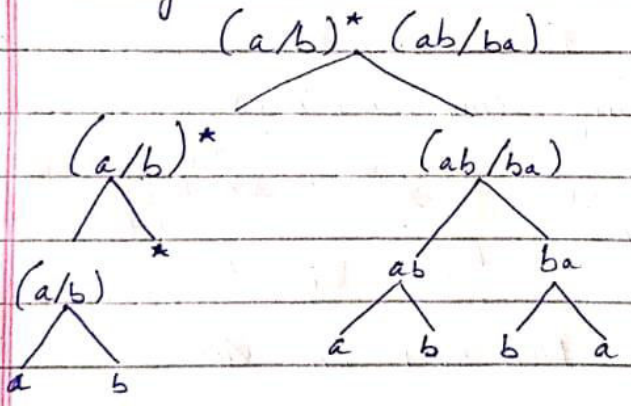
SUBJECT * Automata

FINAL TERM EXAM

Q1: Parse the given R.E into its Individual / Automata symbols and then design an NFA.

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

Ans Parsing:-



→ NFA for As a;

→ (i) —a→ (f) → (i)

⇒ NFA for As B;

→ (i) —b→ (f) → (ii)

→ Now, NFA for ab:-

Combine (i) and (ii)

→ (i) —a→ 0 → (f) → (iii)

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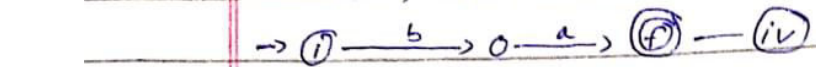
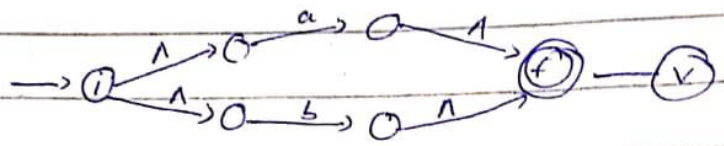
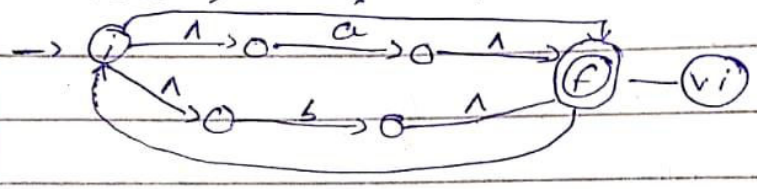
=> Now, NFA for ba:-



Now, NFA for a/b:-

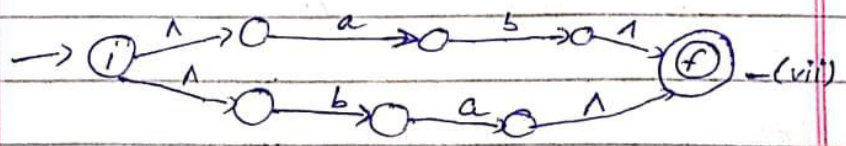


=> Now, NFA of Λ for (a/b)*

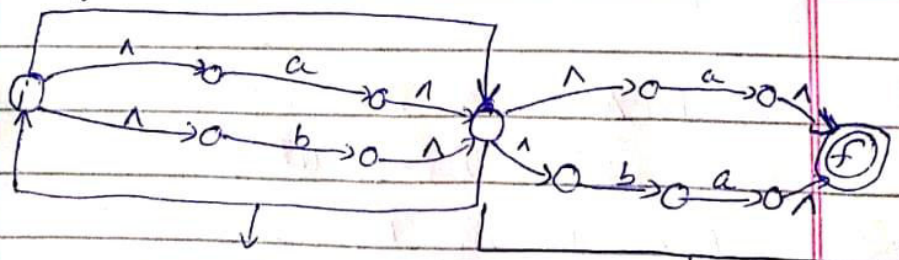


=> NFA for (ab/ba)

Combining (iii) and (iv)



Major NFA (vi) and (vii)



Q1) Design RE for each of the following.

(i) RE for all the optional words over {a b}.

Ans $(a/b)^*$

(ii) RE for all the optional word over {a b} with an Even number of "a".

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

(iii) RE for all the optional word over {a b} with an odd No of "a".

Ans $b^*a(b^*a\ b^*a\ b^*)^*$

iv) RE for all the optional word over {a b} where Last symbol must be "b".

Ans $(a+b)b$

V) RE for all optional word over {a b} where first symbol must be "b".

Ans $b(a+b)$

Q 3(a) Prove that :-

$$(a/b)^* \; != \; a^* b^*$$

Sol:- $(a/b)^* \; != \; a^* b^*$

for $a^* \; b^*$

$a^0 \; b^0 = 1 = \wedge$

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

$a^1 \; b^1 = ab$

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

$a^* \; b^* = \{\wedge, a, ab, b, bb, \ldots\}$ — (1)

$(a/b)^*$

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

$(a/b)^1 = a$ or b $\quad a, b$

$(a/b)^1 = aa, ab, ba, bb$

...

So,

$(a/b)^* = \{\wedge, a, b, aa, ab$

$\ldots\}$ — (2)

that

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

OR

$$(a/b)^* \; != \; a^* b^*$$ Ans

Q3(b) Derive language discription.

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

Ans: Language for word over {a, b} which start with "aa" or 'ba' followed by b and end with any Letter.

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

L = {a, b} where string start with any Letter followed by 'b' and end with 'aa' or 'bb' or bb

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

Ans: L {a, b} where last word must be two 'a's or two 'b'.

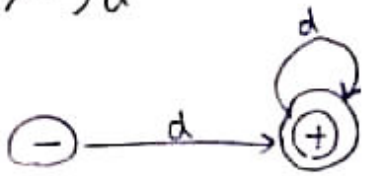
(iv) $(aa/bb)\ (a/b)^*$

Ans: L = {a, b} where first symbol must be aa bb string must start with "aa" or "bb".

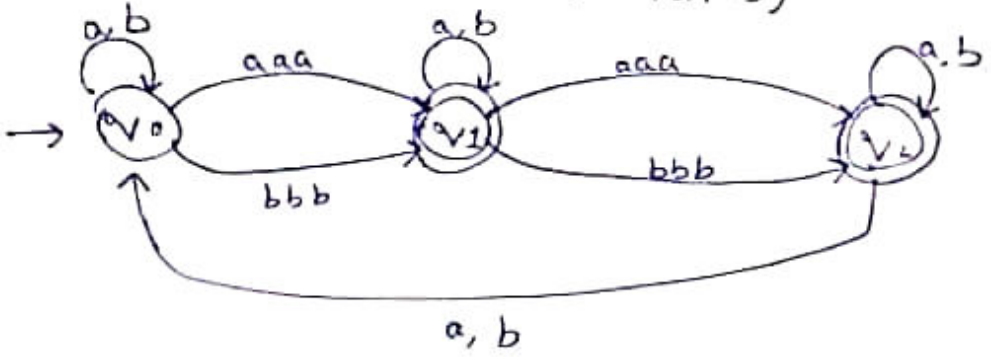
Q4 Design NFA for the following without Parsing.

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

Sol:



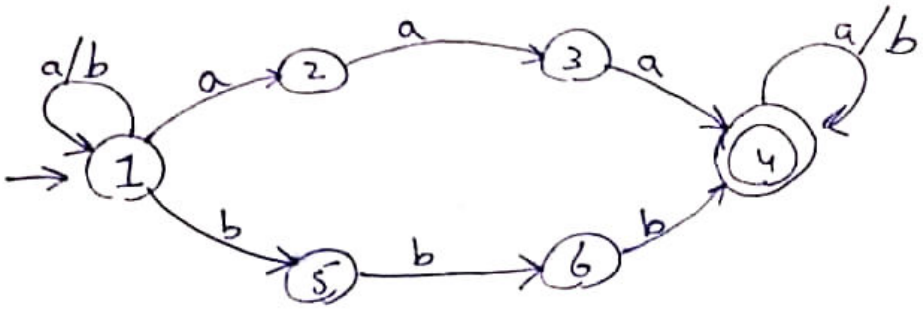
(ii) $(a/b)^*\ (aaa/bbb)\ (a/b)^*$



Q4 Design NFA for the following without Parsing.

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

Ans: $(a/b)^*(aaa/bbb)(a/b)^*$



{ aaa, bbb, aaaabb, aaabbb