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FA TUTORIAL 1

Q1 Write regular expression
a] even number of a's
b] binary number divisible by 3

ANS a ~~Finite automata will be~~

$\Sigma = \{a, b\}$

$\therefore r = (b + ab^*ab^*)^*$

b $\Sigma = \{0, 1\}$

$r = (0 + 1(01^*0)^*1)^*$

Q2 Language corresponding to $r = a^*b(a^*ba^*b)^*a^*$

ANS L = { b, ab, ba, aba, abababa, aab aab aab aab aab aa, aaab aaab aaab aaab aaab aaab aaab aaa, ... }

Q3 $(b + ab)^*(a + ab)^*$

L = { ε, a, b, ab, bab, aba, ba, abab, bba, bbab, ababa, ababab, baa, babab, abaa, ... }

Q4 FSM for string ending in either 010 or 0010

Step 1: $(Q, \Sigma, \delta, q_s, F)$

$Q \Rightarrow$ set of states

$\Sigma \rightarrow$ Input alphabet

$\delta \rightarrow$ Transition

$q_s \rightarrow$ starting state

$F \rightarrow$ Final state.

Step 2:

$q_s \rightarrow$ starting state

$q_0 \rightarrow$ Ending with 0

$q_1 \rightarrow$ Ending with 1

$q_2 \rightarrow$ Ending with 01

$q_3 \rightarrow$ Ending with 010

$q_4 \rightarrow$ Ending with 00

$q_5 \rightarrow$ Ending with 0010

$q_6 \rightarrow$ Ending with 0010

Step 3:

$Q : \{q_s, q_0, q_1, q_2, q_3, q_4, q_5, q_6\}$

$\Sigma : \{0, 1\}$

$\delta : Q \times \Sigma$

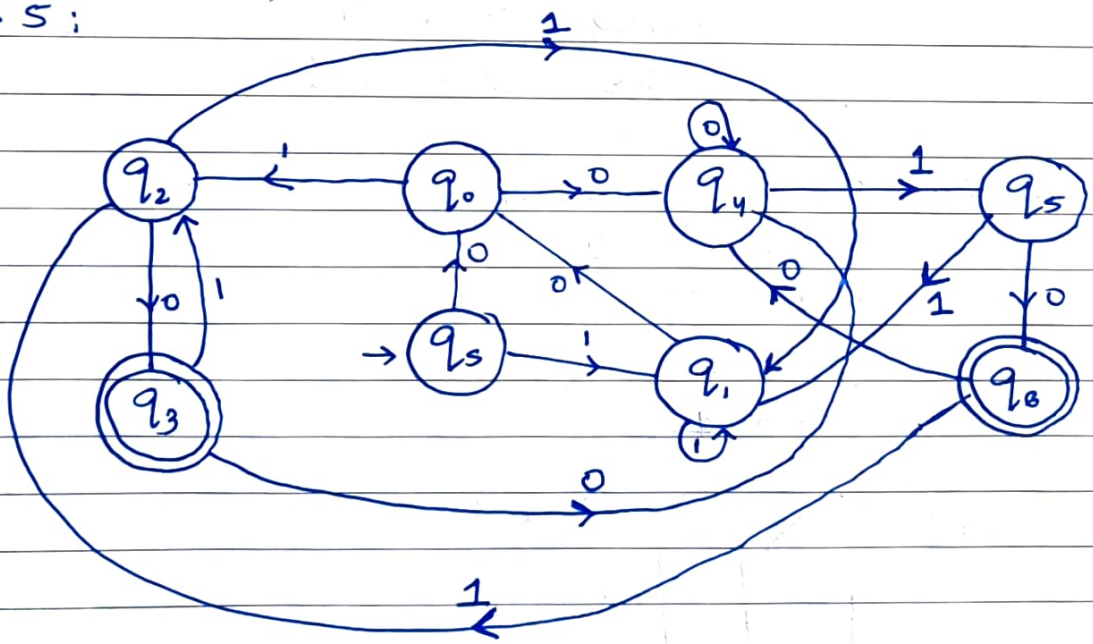
$q_s : \{q_s\}$

$F : \{q_3, q_6\}$

step 4: $\delta \rightarrow Q \times \Sigma$

	Q \ Σ	0	1
→	q_5	q_0	q_1
	q_0	q_4	q_2
	q_1	q_0	q_1
	q_2	q_3	q_1
*	q_3	q_4	q_2
	q_4	q_4	q_5
	q_5	q_6	q_1
*	q_6	q_4	q_2

step 5:



Q5 FSM that will accept the word banana using only 3 states

ANS A finite automation is a collection of 5 tuples $(Q, \Sigma, \delta, q_0, F)$

STEP 1 : $(Q, \Sigma, \delta, q_s, F)$

$Q \rightarrow$ set of states

$\Sigma \rightarrow$ Input alphabet

$\delta \rightarrow$ Transition function

$q_s \rightarrow$ Starting state

$F \rightarrow$ Final state.

STEP 2 : $q_s \rightarrow$ starting state

$q_0 \rightarrow$ Ending with b

$q_1 \rightarrow$ Ending with ba(na)*

~~$q_2 \rightarrow$ Ending with ba(na)*~~

STEP 3 : $Q : \{ q_s, q_0, q_1, \}$

$\Sigma : \{ b, a, n \}$

$\delta : Q \times \Sigma$

$q_s : \{q_s\}$

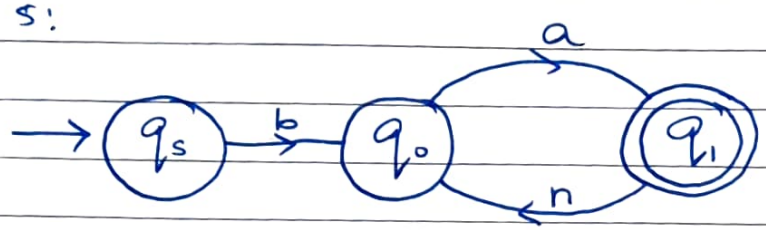
$F : \{q_1\}$

STEP 4 :

	Q \ Σ	b	a(na)*
→	q_s	q_0	q_1
b	q_0	q_0	q_1
* ba(na)*	q_1	q_0	q_1

3

STEP 5:



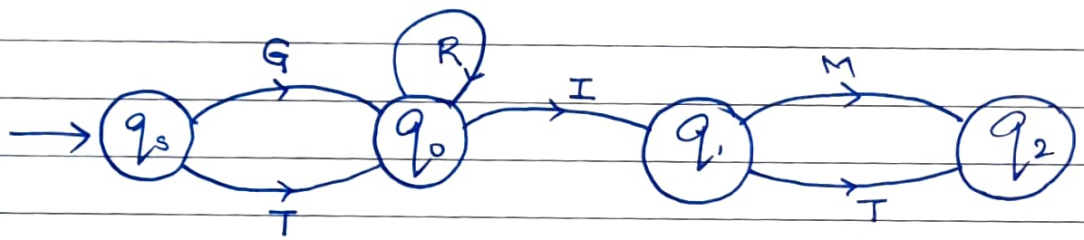
Q6 FSM that will accept the words

TIM

GRIT

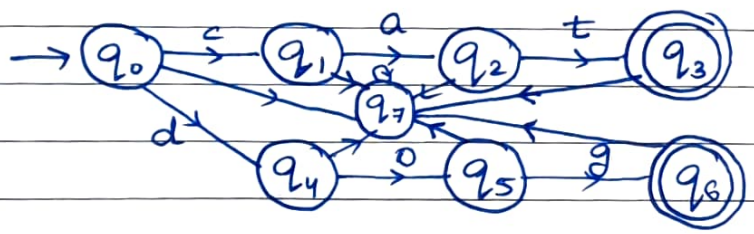
G RRRRRIM

ANS



Q7 FSM accepting either cat or dog.

ANS a] Accepts cat or dog alone.



b] Accepts strings containing CAT or DOG ANYWHERE