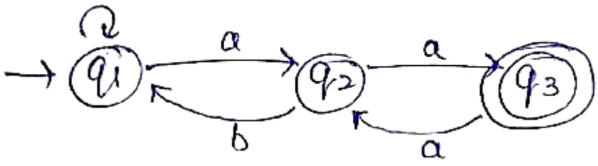
Pankaj Singh 21SCSE1010268
B-Tech CSE Elective section - 06

Assignment-02

Q. Convert FA to regular expression using aderns Theorm.



$q_3 = q_2 a$ —(i)

$q_2 = q_1 a + q_2 a + q_3 b$ —(ii)

$q_1 = \epsilon + q_1 a + q_2 b$ —(iii)

from (i)

$q_3 = q_2 a$

$= (q_1 a + q_2 b + q_3 b) a$

$= q_1 aa + q_2 ba + q_3 ba$ —(iv)

from (ii)

$q_2 = q_1 a + q_2 b + q_3 b$ (∵ putting value of q_3 from (i))

$= q_1 a + q_2 b + (q_2 a) b$

$= q_1 a + q_2 b + q_2 ab$

$\underbrace{q_2}_{R} = \underbrace{q_1 a}_{Q} + \underbrace{q_2}_{R}\underbrace{(b + ab)}_{P}$ —(v)

from (iii) Putting value of q_2 from (v)

$\underbrace{q_1}_{R} = \underbrace{\epsilon}_{Q} + q_1 a + ((q_1 a)(b + ab)^*) b$

$\underbrace{q_1}_{R} = \epsilon + q_1 (a + a(b + ab)^*) b$

$R = Q + RP$

$R = QP^*$

$\epsilon \cdot R = R$

$q_1 = \epsilon((a + a(b + ab)^* b)^*$

$q_1 = (a + a(b + ab)^* b)^*$ —(vi)

final state q_3

$q_3 = q_2 a$ $\quad$ ($\because$ Putting val. q_2 from ⓥ)

$= q_1 a (b+ab)^* a$

$= (a+a(b+ab)^* b)^* a (b+ab)^* a$ (Putting val (q_1) from (VI))

Q.2. Using pumping lemma prove that language.
$A = \{a^n b^n \mid n \geq 1\}$ is not regular.

$n = 4$ [suppose]

$w = a^n b a^n b$

$w = a^4 b a^4 \quad |w| = 10$

$|w| = 10 > n = 4$

$a^1 a^2 a^1 b a^4 b$

$a^3 a^r a^{n-sr} b a^n b$

$= \underset{x}{\underline{a}} \quad \underset{y}{\underline{aa}} \quad \underset{z}{\underline{aba^4b}}$

$xy^i z \in L \quad i = 1$

$xy^i z \notin L \quad i = 2$

① Assume L is a regular language FA n state

② $w = a^n b a^n b$

$|w| = 2n + 2 \geq n$

$w = xyz$

$|y| > 0$ $\qquad$ $[w = \underset{x}{a^s} \; \underset{y}{a^r} \; \underbrace{a^{n-s-r} b a^n b}_{z}]$

$|xy| < n$

③ $xy^i z \in L$

$a^3 a^r a^{n-s-r} b a^n b$

$a^s (a^r)^2 a^{n-s-r} b a^n b \cdot i = 2 \notin L$

Q.6. find the Derivation of input string id1 + id2 * id3 for the grammer where $E \to E | E * E | id$.

Ans:- Consider the following grammer

$E \to E + E | E + E | id$

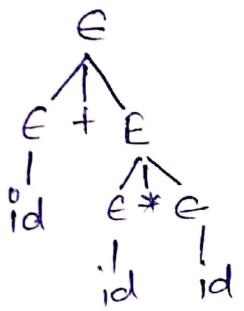
let input string w is id+id* id

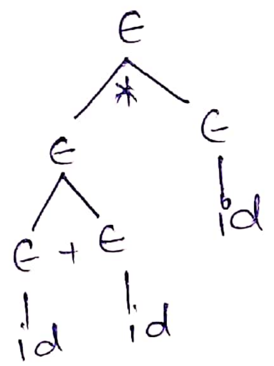
LMD.

$E \to E + E$
$\to id + E \; (E \to id)$
$\to id + E * E \; (E \to E * E)$
$\to id + id * E \; (E \to id)$
$\to id + id * id \; (E - id)$

RMD.

$E \to E * E$
$\to E * id \; (E \to id)$
$\to E + E * id \; (E - E + E)$
$\to E + id * id \; (E - id)$
$\to id + id * id \; (E - id)$





marked then mark [P, Q] where 'y' is an input symbol Repeat this until no more marking can be done combine all unmarked pair and make then as in all state.

mimized DFA

	A	B	C	D	E	F
A						
B	✓	✓				
C	✓	✓				
D	✓	✓				
E						
F				✓	✓	✓

$$(B, A) = \left.\begin{matrix} \delta(B,0) = A \\ \delta(A,0) = B \end{matrix}\right\} \quad \left.\begin{matrix} \delta(B,1) = D \\ \delta(A,1) = C \end{matrix}\right\}$$

$$(D, C) = \left.\begin{matrix} \delta(D,0) = E \\ \delta(C,0) = E \end{matrix}\right\} \quad \left.\begin{matrix} \delta(D,1) = F \\ \delta(C,1) = F \end{matrix}\right\}$$

$$(E, C) = \left.\begin{matrix} \delta(C,0) = E \\ \delta(C,0) = E \end{matrix}\right\} \quad \left.\begin{matrix} \delta(C,1) = F \\ \delta(C,1) = F \end{matrix}\right\}$$

$$(E, D) = \left.\begin{matrix} \delta(E,0) = E \\ \delta(D,0) = E \end{matrix}\right\} \quad \left.\begin{matrix} \delta(E,1) = F \\ \delta(D,1) = F \end{matrix}\right\}$$

$$(F, A) = \left.\begin{matrix} \delta(F,0) = F \\ \delta(A,0) = B \end{matrix}\right\} \quad \left.\begin{matrix} \delta(F,1) = F \\ \delta(A,1) = C \end{matrix}\right\}$$ Mark DO
Mark FA

$$(F, B) = \left.\begin{matrix} \delta(F,0) = F \\ \delta(B,0) = A \end{matrix}\right\} \quad \left.\begin{matrix} \delta(F,1) = F \\ \delta(B,1) = D \end{matrix}\right\}$$ Mark
FB

	A	B	C	D	E
B					
C	✓	✓			
D	✓	✓			
E	✓	✓			
F	✓	✓	✓	✓	✓