FA ⇔ RG ⇔ RE

I) FA ⇔ RG

1. Given the regular grammar $G = (\{S, A\},\ \{a, b\},\ P,\ S)$

$$P:\ S \rightarrow \varepsilon \mid aA$$
$$A \rightarrow aA \mid bA \mid a \mid b,$$

build the equivalent FA.

Sol.:

$M = (Q,\ \Sigma,\ \delta,\ q_0,\ F)$

$Q = \{S, A, K\}$

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

$q_0 = S$

$F = \{K, S\}$

$\delta(S, a) = \{A\}$

$\delta(A, a) = \{A, K\}$

$\delta(A, b) = \{A, K\}$

2. Given the following FA $M = (Q,\ \Sigma,\ \delta,\ q_0,\ F)$

$$Q = \{p, q, r\},\ q_0 = p,\ F = \{p,\ r\},\ \Sigma = \{0, 1\}$$

δ	0	1
p	q	p
q	r	p
r	r	r

build the equivalent right linear grammar.

Sol.:

$G = (N,\ \Sigma,\ P,\ S)$

$N = \{p, q, r\}$

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

$S = p$

$P : p \text{ –> } 0q \mid 1p \mid 1 \mid \varepsilon$

$q \rightarrow 0r \mid 0 \mid 1p \mid 1$
$r \rightarrow 0r \mid 0 \mid 1r \mid 1$

II) RG ⇔ RE

3. Give the RG corresponding to the following RE $0(0+1)^*1$.

$0: G_1 = (\{S_1\}, \{0,1\}, \{S_1 \rightarrow 0\}, S_1)$
$1: G_2 = (\{S_2\}, \{0,1\}, \{S_2 \rightarrow 1\}, S_2)$
$0+1 \quad G_3 = (\{S_1, S_2, S_3\}, \{0,1\}, \{S_1 \rightarrow 0, S_2 \rightarrow 1, S_3 \rightarrow 0 \mid 1\}, S_3)$
$G'_3 = (\{S_3\}, \{0,1\}, \{S_3 \rightarrow 0 \mid 1\}, S_3)$
$(0+1)^* \quad G_4 = (\{S_3\}, \{0,1\}, \{S_3 \rightarrow 0 \mid 1 \mid \varepsilon \mid 0S_3 \mid 1S_3\}, S_3)$
$G'_4 = (\{S_3\}, \{0, 1\}, \{S_3 \rightarrow 0S_3 \mid 1S_3 \mid \varepsilon\}, S_3)$! not regular
$0(0+1)^* \quad G_5 = (\{S_1, S_3\}, \{0,1\}, \{S_3 \rightarrow 0S_3 \mid 1S_3 \mid \varepsilon, S_1 \rightarrow 0S_3\}, S_1)$! not regular
$0(0+1)^*1 \quad G_6 = (\{S_1, S_2, S_3\}, \{0,1\}, \{S_2 \rightarrow 1, S_1 \rightarrow 0S_3, S_3 \rightarrow 0S_3 \mid 1S_3, S_3 \rightarrow S_2\}, S_1)$
G_6 not regular

Sol.: $G'_6 = (\{S_1, S_3\}, \{0,1\}, \{S_1 \rightarrow 0S_3, S_3 \rightarrow 0S_3 \mid 1S_3 \mid 1\}, S_1)$

4. Give the RE corresponding to the following grammar
$G = (\{S, A, B\}, \{a, b\}, P, S)$
$P: S \rightarrow aA$
$A \rightarrow aA \mid bB \mid b$
$B \rightarrow bB \mid b$

Sol.: **//???**

S = aA

A = aA + bB + b

B = bB + b

We know that rule 1

X = aX+b

X = a*b

B = b*b by rule 1

B = b^+

A = aA + B

A = aA + b^+

A = a*b^+ by rule 1

S = aa*b^+ = a^+ b^+

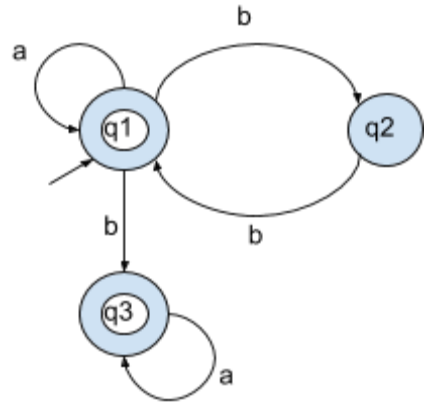
=> S = a^+b^+

III) FA ⇔ RE

5. Give the FA corresponding to the following RE $01(1+0)^*1^*$.

Sol: on pdf board attached to MSTeams Seminar7 meet

6. Give the regular expression corresponding to the FA below.



//Hategan Ariana

q1 = epsilon + q1 a + q2 b
q2= q1 b
q3=q1 b + q3 a

X = Xa + b => sol: X=ba*

q3=q1ba*
q1=epsilon + q1a + q1bb = epsilon + q1(a+bb) => q1 = (a+bb)*

Regular expression: q1 + q3= (a+bb)* + (a+bb)*ba* = (a+bb)*(epsilon+ba*)