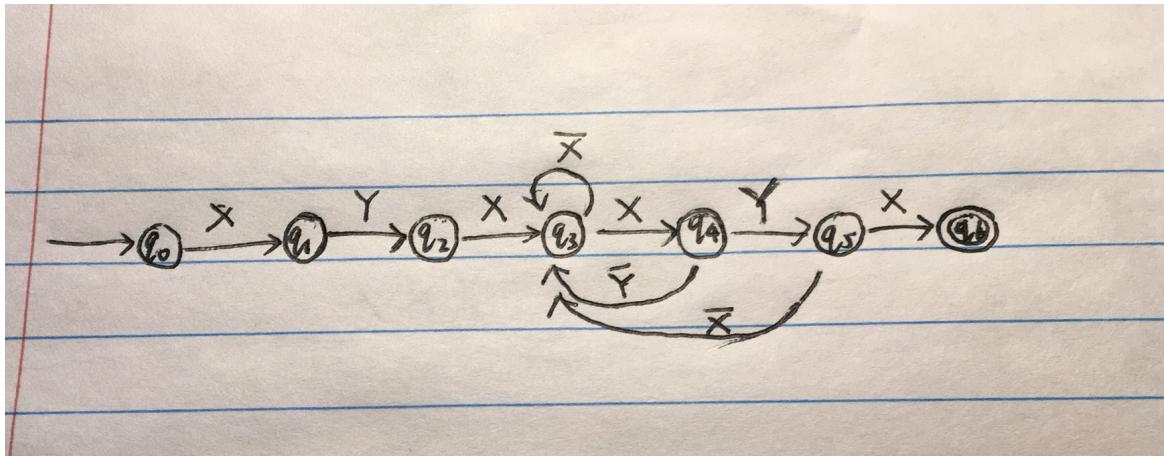


1.

$XYX([\wedge X] \mid X[\wedge Y] \mid XY[\wedge X])^*XYX$



Proof: $q_0 = \epsilon, q_1 = q_0X, q_2 = q_1Y, q_3 = q_2X + q_3\bar{X} + q_4\bar{Y} + q_5\bar{X}, q_4 = q_3X, q_5 = q_4Y, q_6 = q_5X$

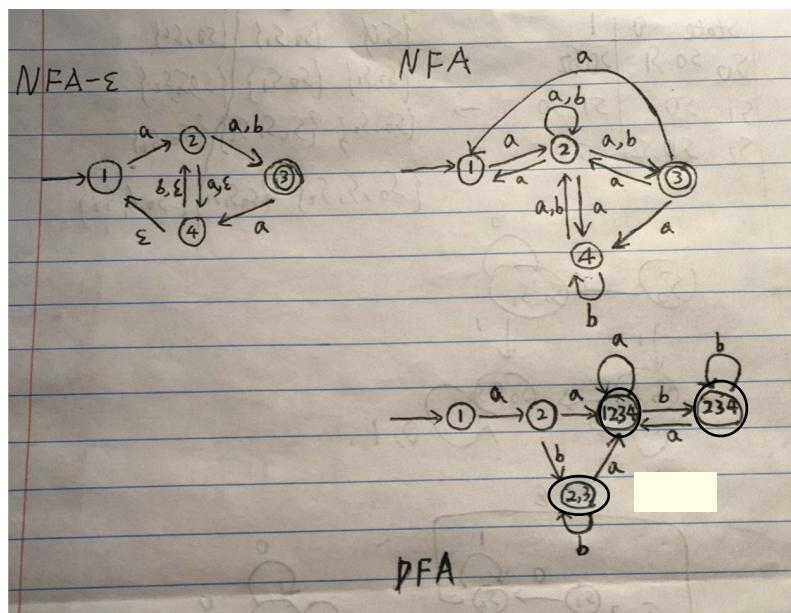
$$q_3 = \epsilon XYX + q_3\bar{X} + q_3X\bar{Y} + q_3XY\bar{X} = \epsilon XYX + q_3(\bar{X} + X\bar{Y} + XY\bar{X})$$

Since $R = Q + RP \rightarrow R = QP^*$ and $\epsilon R = R$, $q_3 = XYX(\bar{X} + X\bar{Y} + XY\bar{X})^*$

$$q_6 = q_3XYX = XYX(\bar{X} + X\bar{Y} + XY\bar{X})^*XYX$$

Regular Expression for q_6 (final state): $XYX([\wedge X] \mid X[\wedge Y] \mid XY[\wedge X])^*XYX$

2.



NFA transition table δ

State	a	b
1	2	
2	1,2,3,4	2,3
3	1,2,4	
4	2	2,4

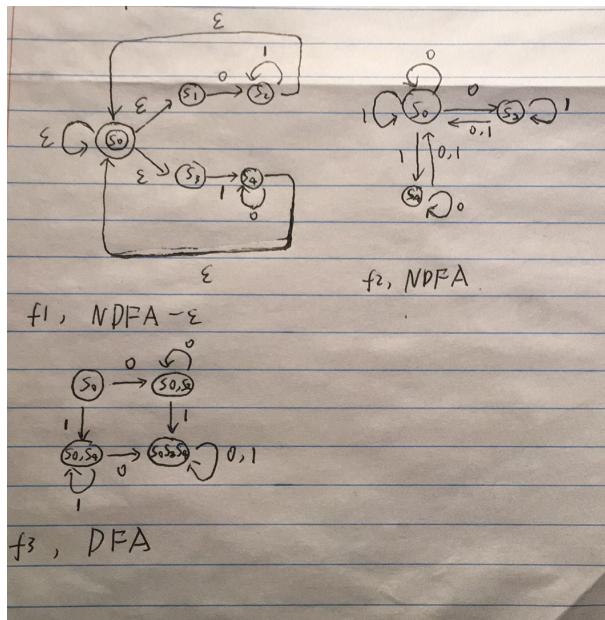
DFA transition table δ'

State	a	b
1	2	
2	1,2,3,4	2,3
1,2,3,4	1,2,3,4	2,3,4
2,3	1,2,3,4	2,3
2,3,4	1,2,3,4	2,3,4

Starting state: 1

Finish state: any state contain NFA finish state 3 – 1234,234,23

3. $(01^*|10^*)^*$, we first get NFA-epsilon, then we git rid of empty string input getting NFA



NFA transition table δ

State	0	1
s ₀	s ₀ , s ₂	s ₀ , s ₄
s ₁	s ₀	s ₀ , s ₂
s ₂	s ₀ , s ₄	s ₀

DFA transition table δ'

State	0	1
s ₀	s ₀ , s ₁	s ₀ , s ₂
s ₀ , s ₁	s ₀ , s ₁	s ₀ , s ₁ , s ₂
s ₀ , s ₂	s ₀ , s ₁ , s ₂	s ₀ , s ₂
s ₀ , s ₁ , s ₂	s ₀ , s ₁ , s ₂	s ₀ , s ₁ , s ₂

For DFA, starting state: s₀

finishing state: any state contain NFA finish state s₀ → s₀, s₀s₁, s₀s₂, s₀s₁s₂