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Tutorial (1)

01) b

02) b

03) d

04) 1

05)

Let $w = e$

$(w^R)^R = (e^R)^R = e^R = e = w$

Assume $(w^R)^R = w$ for $|w| \leq n$.

Let $|w| = n+1$

Then $w = ua$ for some $u \in \Sigma^*$ and $a \in \Sigma$ such that $|u| = n$

$(w^R)^R = ((ua)^R)^R$

$= (a^R u^R)^R = (u^R)^R (a^R)^R$

$= ua$

$= w$

$\therefore (w^R)^R = w$

06) abaabaaabaa
baaaaabaa

07) $L' = \Sigma^* - L$

08) $L' = \Sigma^* - L$

Σ^* is infinite

Assume L is finite. And then L' should be infinite

And now assume L' is finite.

Then L should be infinite.

As you see both L and L' cannot finite simultaneously.

9) a) $\{b^*ab^*\}$

b) $\{b^*a^+b^*\}$

c) $\{b^* | b^*ab^* | b^*ab^*ab^* | b^*ab^*ab^*ab^*\}$

d) $\{b^*(ab^*ab^*a)(a^*b^*)^*\}$

10) $S \rightarrow aA$

$A \rightarrow bS$

$S \rightarrow \varepsilon$

$S \rightarrow aA \rightarrow abS \rightarrow ab$

$S \rightarrow aA \rightarrow abS \rightarrow abaA \rightarrow ababS$

$S \rightarrow \varepsilon$

$L = \{(ab)^n | n > 0\}$

11) $S \rightarrow Aa \rightarrow Ba \rightarrow Aaa \rightarrow Aaaa$

$L = \{A(a)^n | n > 0\}$

12) $S \rightarrow aSb | ab | \lambda$

$S \rightarrow \lambda$

can generate null string

$S \rightarrow aAb | ab$

$A \rightarrow aAb | \lambda$

$S \rightarrow aAb$

can't generate null string.

The two grammars are not equivalent

13) $S \rightarrow aSb | bSa | SS | a$

$SS \rightarrow aSbS \rightarrow aaba$

$S \rightarrow aSb | bSa | a$

we can not make aaba.

So these two are not equivalent.

DFA

01) a) This is not a DFA.
Because there is no option when q_1 meets "a".

b)

Present State	a	b
Q_0	Q_1	Q_2
Q_1	–	Q_2
Q_2	Q_2	Q_2

02) a) $M = \{Q, \Sigma, \delta, q_0, F\}$

$Q \Rightarrow$ A finite set of states

$\Sigma \rightarrow$ Finite set of input symbols

$\delta \Rightarrow Q \times \Sigma \rightarrow Q$

$q_0 \in Q \Rightarrow$ Initial state

$F \subseteq Q$; Set of final states.

b)

Present State	0	1
a	b	a
b	b	c
c	–	–

c) This is not a DFA. Because when c meets 1 or 0, there is no option.

03) a) **DFA**

*. Empty string transitions are not allowed
*. Transitions are heading to single position

NFA

*. Empty string transitions are allowed.
*. Transition may head to multiple positions.

b)

(i)

Present State	a	b
q_0	q_0, q_2	-
q_1	-	q_1
q_2	-	-

(ii) accept : ab
Reject : aba

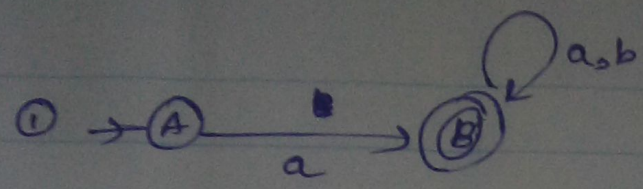
04) (i) Yes. There is a empty string here.

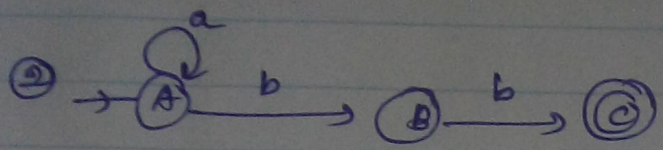
(ii)

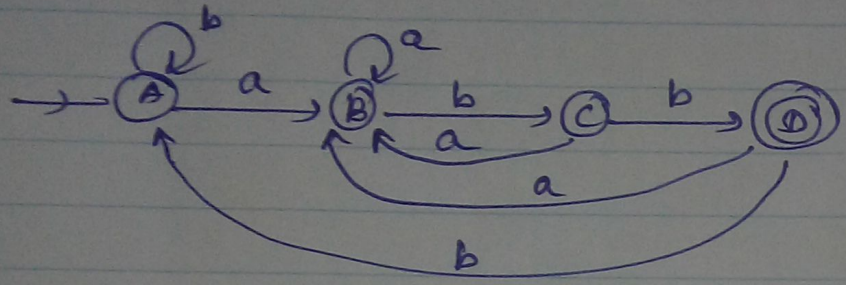
Present State	a	b	ε
q_0	q_0	q_2	
q_1			
q_2			q_3, q_1
q_3	q_1		

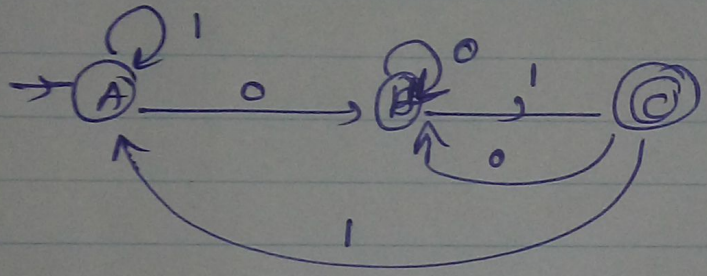
(iii) accept : ab Reject aba

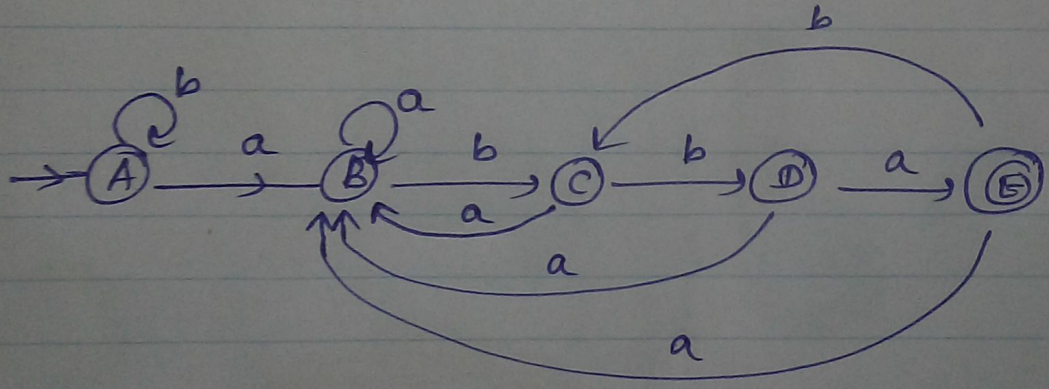
(iv) q_2 can be removed.

v) 



•6) 

•5) 

•7) 

•8) b

•9) c