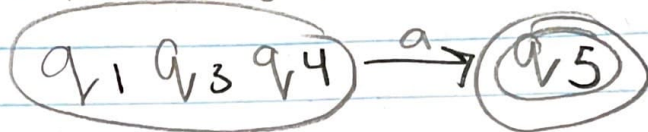1) Remove inaccessible states q_2 & q_6. Next, partition into equivalence class.

q_1 q_3 q_4 q_5

non final state   Final state

No further partitioning possible since q_1 q_3 q_4 are indistinguishdl

2) a) $(a+b+c)^*$

b) a

c) a

d) $(\lambda)^*$

e) $(\lambda)^* + (ab)^*$

3) a) $(0+10)^* (11)(0+01)^* + (0+10)^* (0+01)^*$

On the left side, we have all strings that include the substring "11" since they can have a ∞ amount of 0 or 10's preceding the "11" & ∞ amount of 0 or 01's following the "11". This makes sure the "11" substring is always padded by a 0 on either end, and allows for any amount of solo 1's. The right side is any string without "11" as substring, collection of 0's with a stray 1 sometimes.

3)b) $1^*(0^*11^*)^*0^*1^*$

Prevent string "0101" with parenthesizes portion since it allows 0 to only be followed by a "11" or, on the outside, by another 0. The left most 1 serves all strings that start with 1's & right most 1 serves all strings that end with 1's.

4) a) $S \to aA \mid a \mid B$
$A \to aB \mid \lambda$
$B \to Aa$

b) $S \to aA \mid a \mid B$
$A \to aB$
$B \to Aa \mid a$

c) $S \to aA \mid a \mid Aa$
$A \to aB$
$B \to Aa \mid a$

5) $S \to AB \mid BA$
$A \to aA \mid a$
$B \to bB \mid b$

$L = (0^n 1^n \mid n >= 0)$

intial state S
FA : two final states A & B
Transition: S to A 0   S to B 1
             A to A 0   A to B 1
             B to A 0   B to B 1