Assignment 1 solution:

1. Write regular expressions for the following languages over the alphabet $\Sigma = \{a, b\}$:

   (a) All strings that do not end with aa.

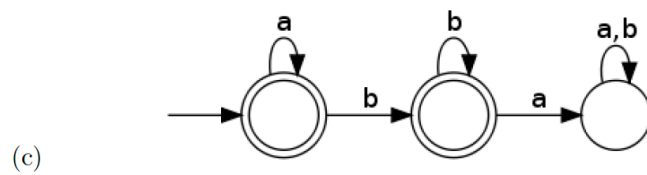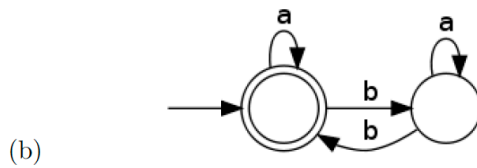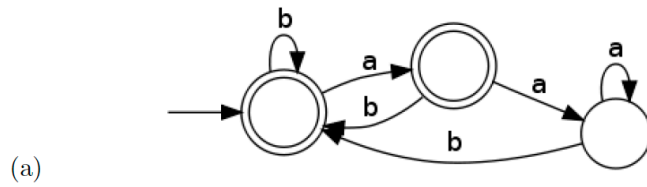 $$\epsilon + a + b + (a + b)^*(ab + ba + bb)$$

   (b) All strings that contain an even number of b's.

   $$a^*(ba^*ba^*)^*$$

   (c) All strings which do not contain the substring ba.

   $$a^*b^*$$

2. Draw DFAs for each of the languages from question 1. None of your DFAs may contain more than 4 states.

(a)

(b)

(c)

3. Write the DFAs tuples {Q, Σ, q0, F, δ} and define each symbol for DFAs from question 2. Provide transition table. Refer to slide # 8 from Chapter 2 slides.

⇒ a)

- $Q = \{q_0, q_1, q_2\}$
- $\Sigma = \{0,1\}$
- start state $= q_0$
- $F = \{q_0, q_1\}$

- Transition Table:

δ	0	1
*q0	q_1	q_0
*q1	q_2	q_0
q2	q_2	q_0

⇒ b)

- $Q = \{q_0, q_1\}$
- $\Sigma = \{0,1\}$
- start state $= q_0$
- $F = \{q_0\}$

- Transition Table:

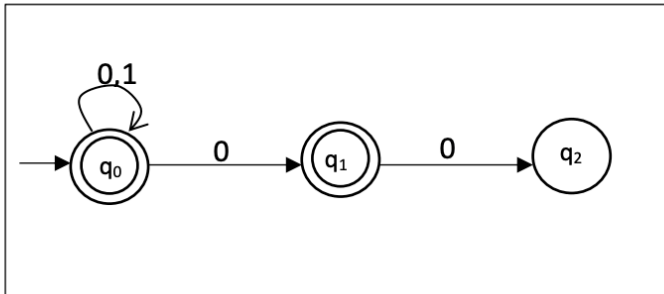| δ	0	1
*q0	q_0	q_1
q1	q_1	q_0

⇒ c)

- $Q = \{q_0, q_1, q_2\}$
- $\Sigma = \{0,1\}$
- start state $= q_0$
- $F = \{q_0, q_1\}$

- Transition Table:

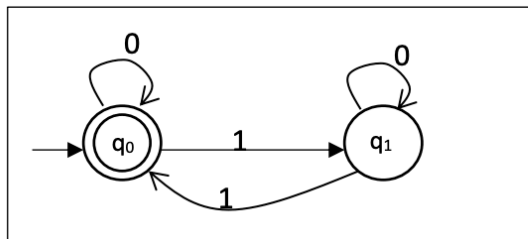| δ	0	1
*q0	q_0	q_1
*q1	q_1	q_2
q2	q_2	q_2

4. Draw NFAs for each in question 1.

⇒ a)

0,1

q_0 0 q_1 0 q_2

⇒ b)
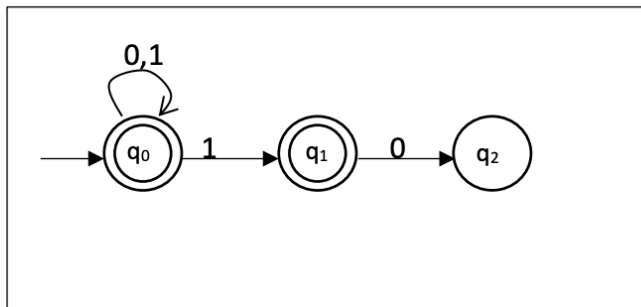
0   0

q_0 1 q_1

1

⇒ c)

0,1

q_0 1 q_1 0 q_2

5. Which languages in question 1 accept these strings? Show the work.

L_a: All strings that do not end with 00.
L_b: All strings that contain an even number of 1's.
L_c: All strings which do not contain the substring 10.

 a) 001101 : L_a
 b) 0101010100 : L_b
 c) 00111111 : L_a , L_b, L_c
 d) 1111000110 : L_a, L_b
 e) 00001111 : L_a, L_b, L_c