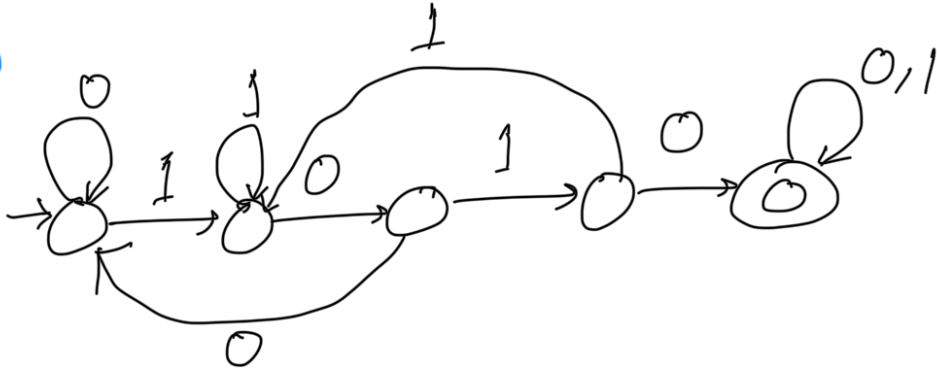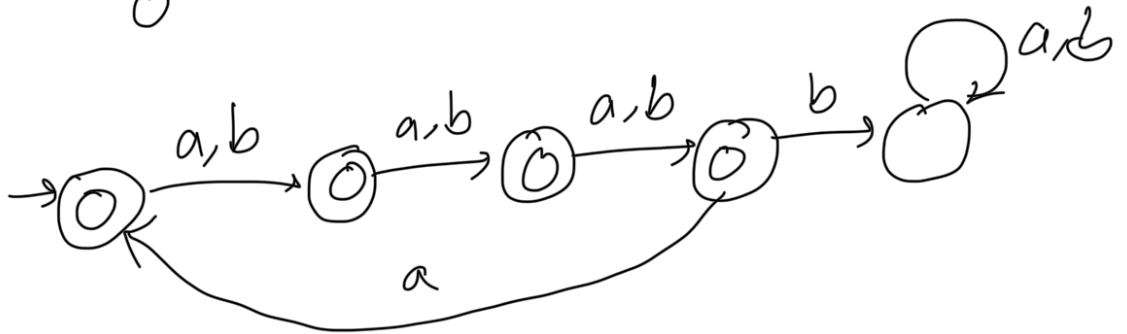# Assignment 1 : Solutions

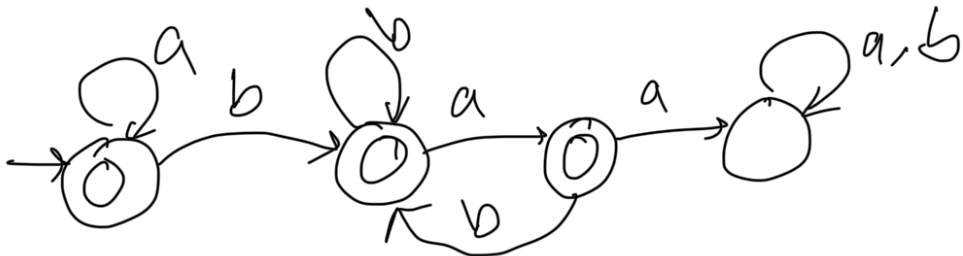1.

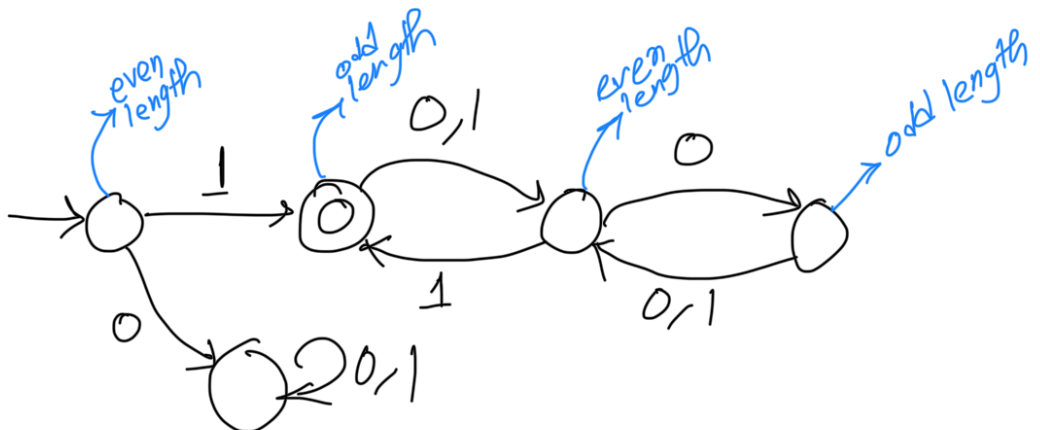a)

b)

c)

d)

e)

States: $x\%3=0$ (start, accepting), $x\%3=1$, $x\%3=2$

- $x\%3=0$ — loop on 0
- $x\%3=0 \xrightarrow{1} x\%3=1$
- $x\%3=1 \xrightarrow{1} x\%3=0$
- $x\%3=1 \xrightarrow{0} x\%3=2$
- $x\%3=2 \xrightarrow{0} x\%3=1$
- $x\%3=2$ — loop on 1

2. a)

$\rightarrow \bigcirc \xrightarrow{1} \bigcirc \xrightarrow{0} \bigcirc \xrightarrow{1} \bigcirc \xrightarrow{0} \circledcirc \;\circlearrowright 0,1$

b)

$\rightarrow \bigcirc \;\circlearrowright 0,1 \xrightarrow{1} \bigcirc \xrightarrow{0,1} \bigcirc \xrightarrow{0,1} \circledcirc$

c)

$\rightarrow \bigcirc \;\circlearrowright a,b \xrightarrow{b} \bigcirc \xrightarrow{a} \bigcirc \xrightarrow{b} \circledcirc$

d)

$\rightarrow \bigcirc \;\circlearrowright a,b \xrightarrow{a} \bigcirc \xrightarrow{b} \bigcirc \;\circlearrowright a,b \xrightarrow{a} \bigcirc \xrightarrow{b} \circledcirc \;\circlearrowright a,b$

e)

$\rightarrow \bigcirc \;\circlearrowright 0,1 \xrightarrow{0} \bigcirc \xrightarrow{1} \bigcirc \xrightarrow{0} \circledcirc \;\circlearrowright 0,1$
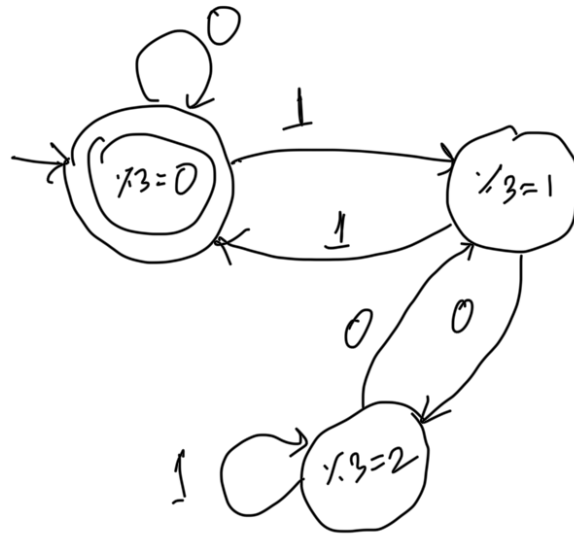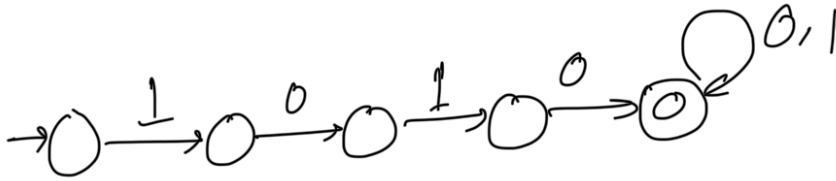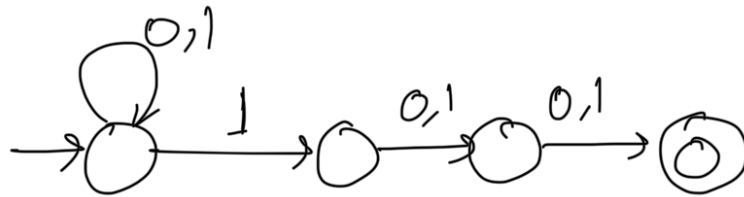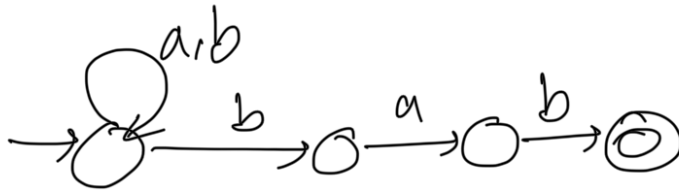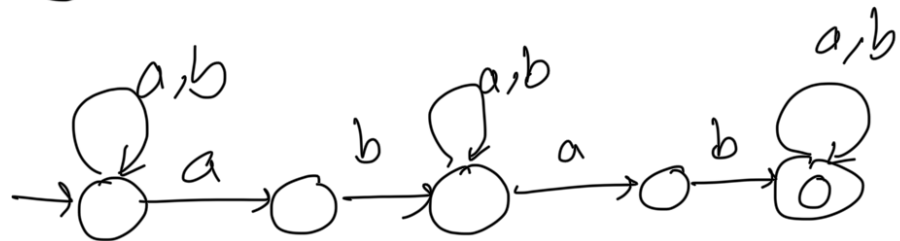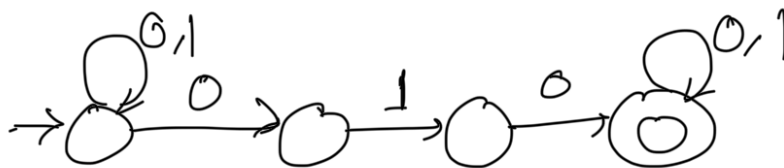
3.

a) $\left((0+1)(0+1) \right)^*$

b) $a\left(a+b\right)\left((a+b)(a+b) \right)^* a \ + \ b\left(a+b\right)\left((a+b)(a+b) \right)^* b$
$+ \ a + b$

c) $1^* 0^* 0 1 \ 1^* 0^*$

d) $a^* \left(b \, aaa^* \right)^*$