CS375 WK5

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August 18, 2011

Figure 1: Q01: $L_1 = (a+b)^*a$
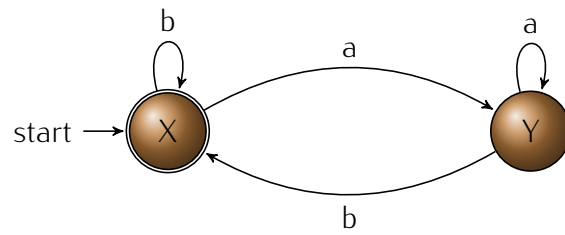

Figure 2: Q01: $L_2 = b(a+b)^*$
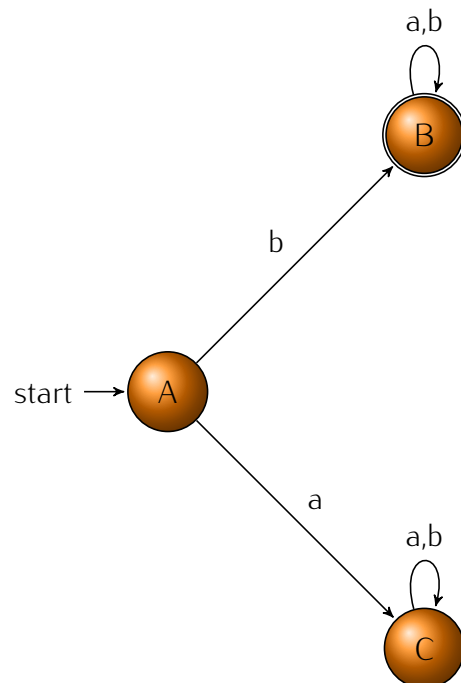
Figure 3: Q01: $L_1 \bigcap L_2$

start $\longrightarrow$ XA

XA $\xrightarrow{b}$ XB

XA $\xrightarrow{a}$ YC

XB $\xrightarrow{a}$ YB

XB $\xrightarrow{b}$ XB

YB $\xrightarrow{a}$ YB

YB $\xrightarrow{b}$ XB

YC $\xrightarrow{a}$ YC

YC $\xrightarrow{b}$ XC

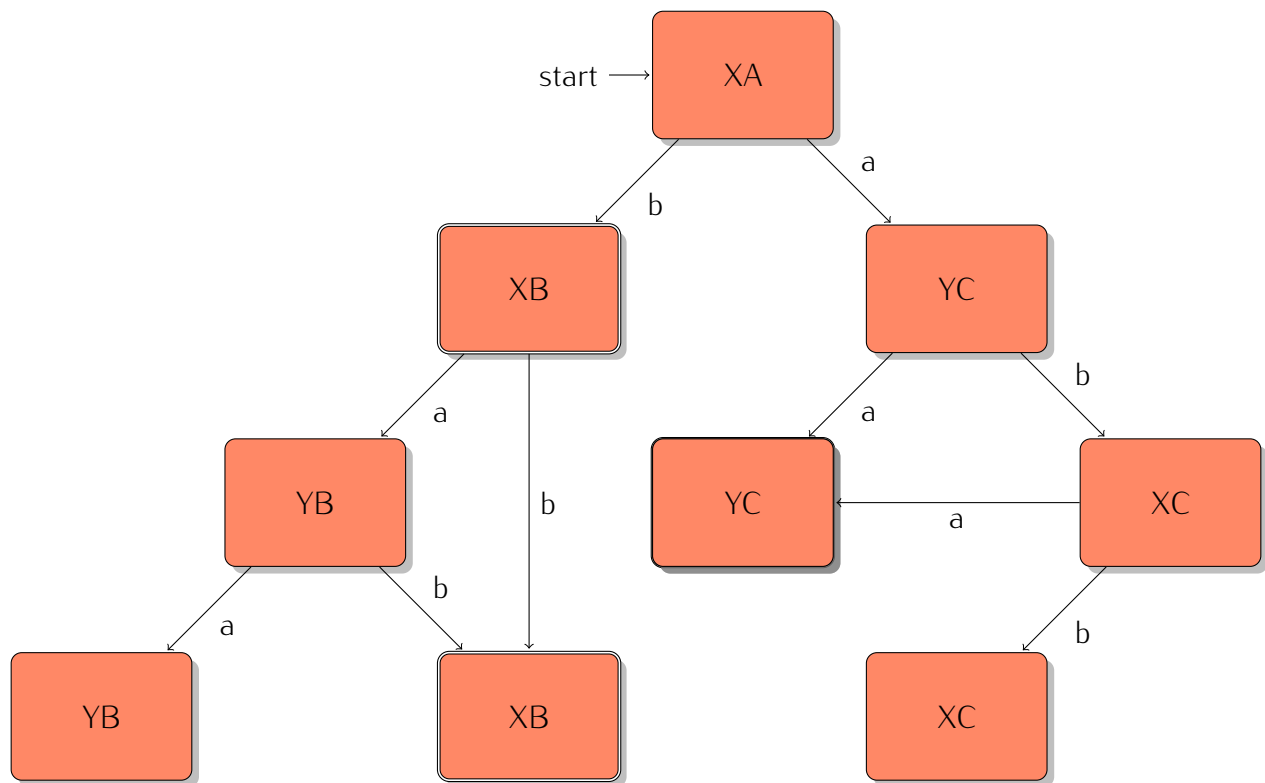XC $\xrightarrow{a}$ YC

XC $\xrightarrow{b}$ XC
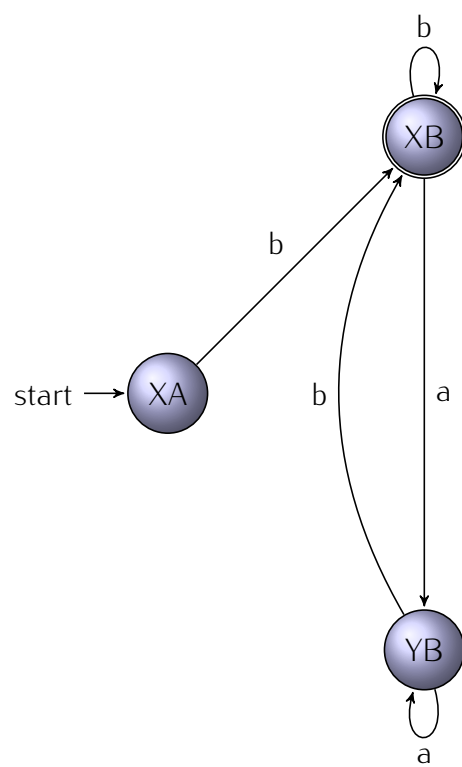
Figure 4: Q01: $L_3 = b(b+aa^*b)^*$

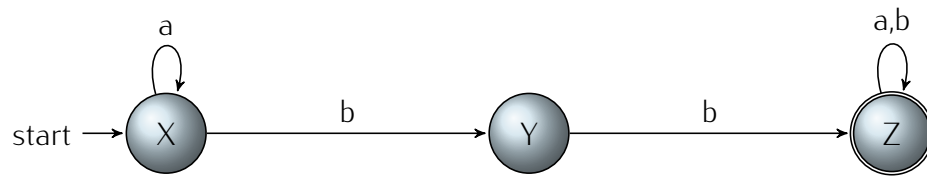**Figure 5:** Q02: $L_1 = (a+b)b(a+b)^*$
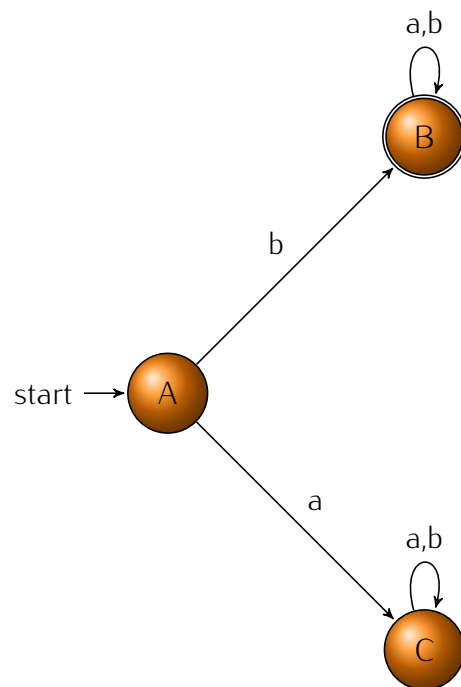

Figure 6: Q02: $L_2 = b(a+b)^*$

Figure 7: Q02: $L_1 \cap L_2$
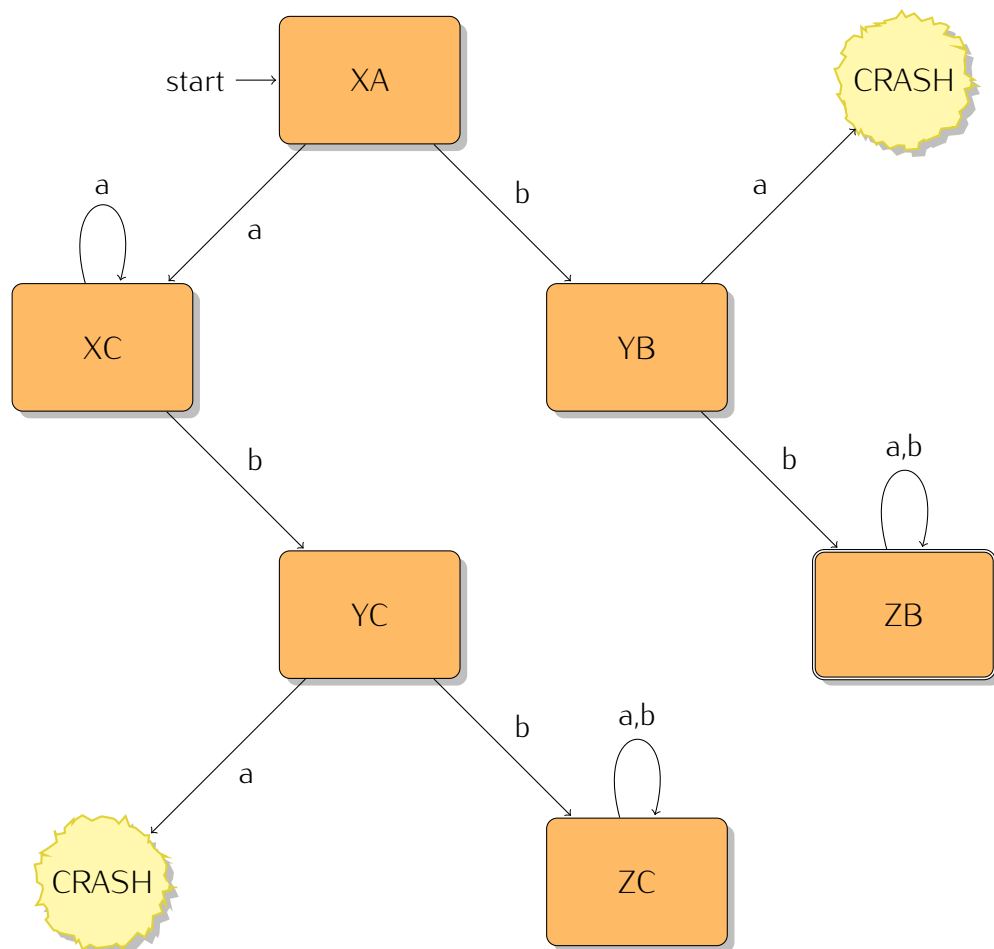
Figure 8: Q02: $L_3 = ab(a+b)^*$

Figure 9: Q03: $L_1 = (b+ab)^*(a+\Lambda)$

b

start → A

a

Λ

b

D

B
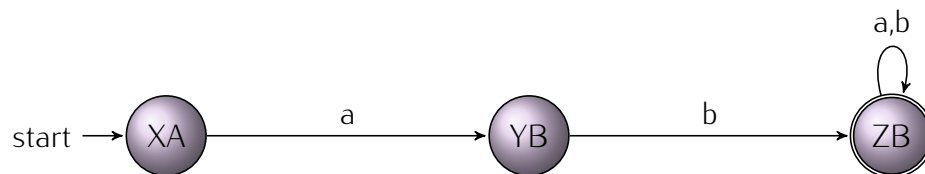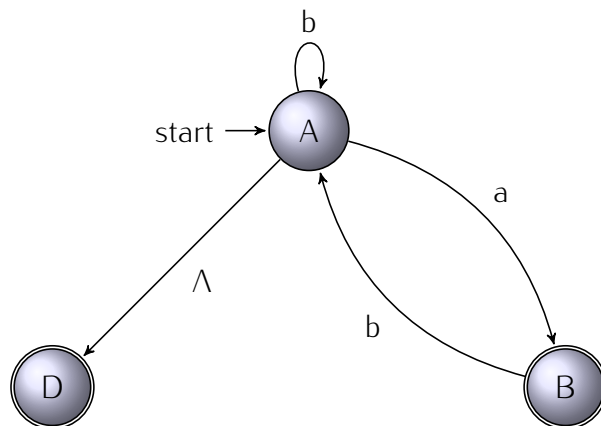
Figure 10: Q03: $L_2 = (a+b)^*aa(a+b)^*$

b

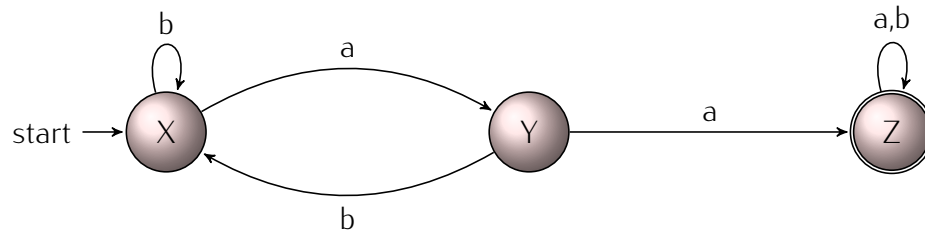a

a,b

start → X

Y

a

Z

b

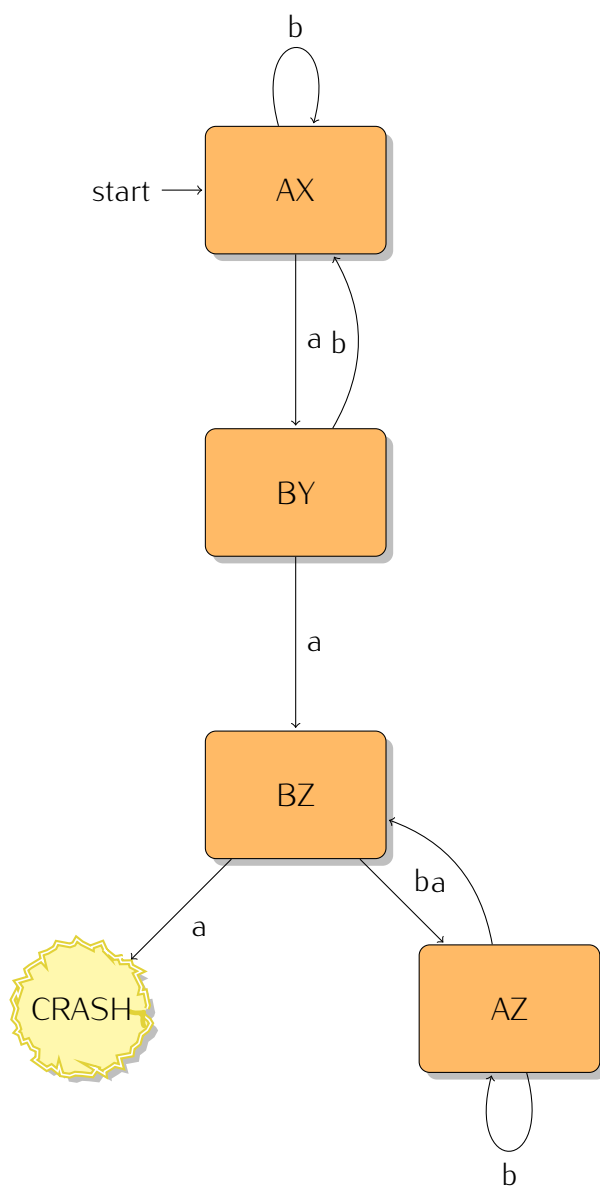**Figure 11:** Q02: $L_1 \bigcap L_2$

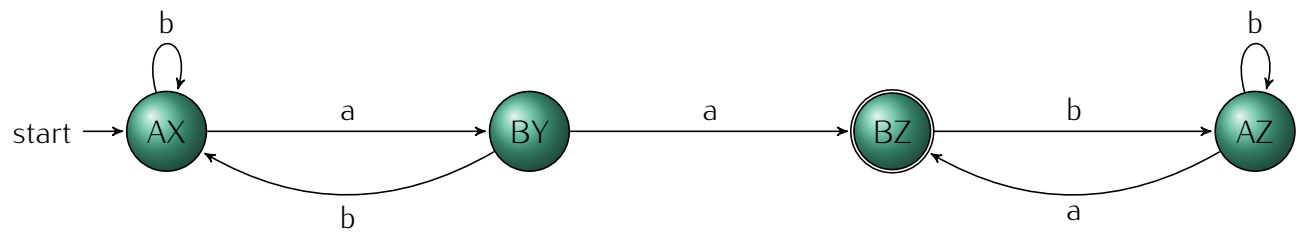**Figure 12:** Q03: $L_3 = (b{+}ab)^*aa(bb^*a)^*$

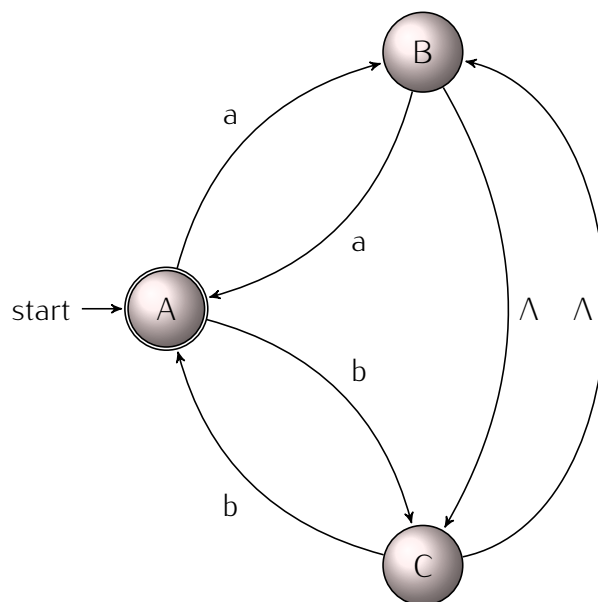**Figure 13:** Q04: $L_1 = (aa+ab+ba+bb)^*$

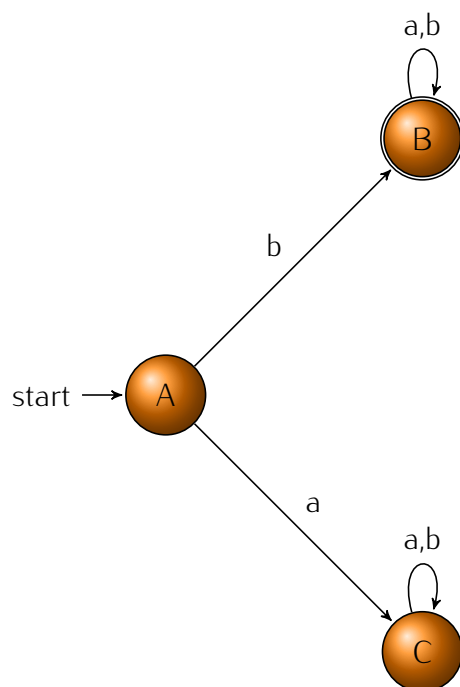**Figure 14:** Q04: $L_2 = b(a+b)^*$
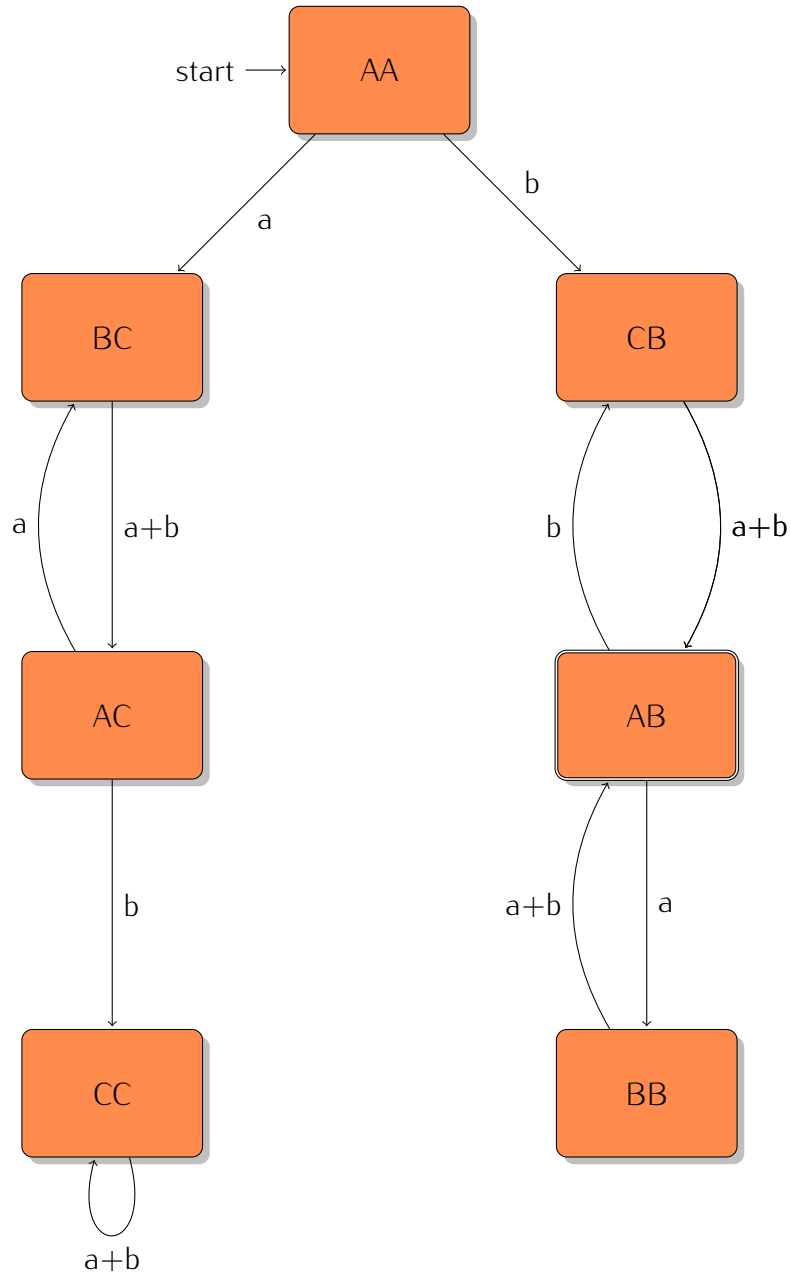
Figure 15: Q04: $L_1 \bigcap L_2$

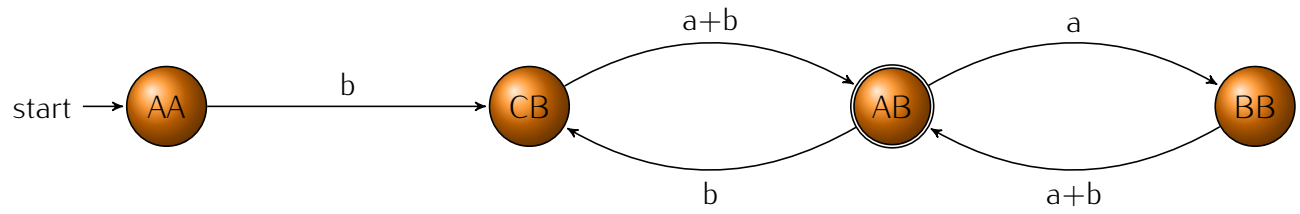**Figure 16:** Q04: $L_3 = b(a+b)(b(a+b)+a(a+b))$

Figure 17: Q05: $L_1 = (aaa+bbb)^*$
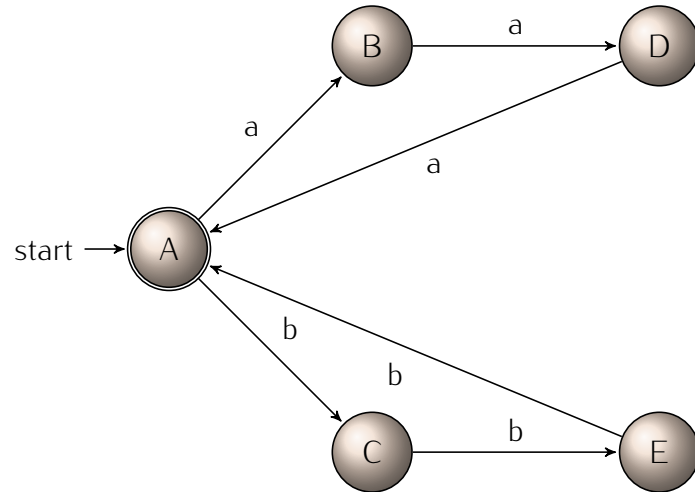

Figure 18: Q05: $L_2 = a(a+b)^*$
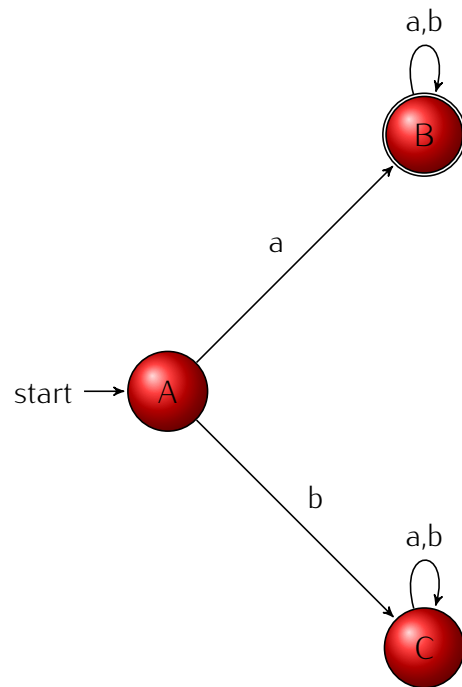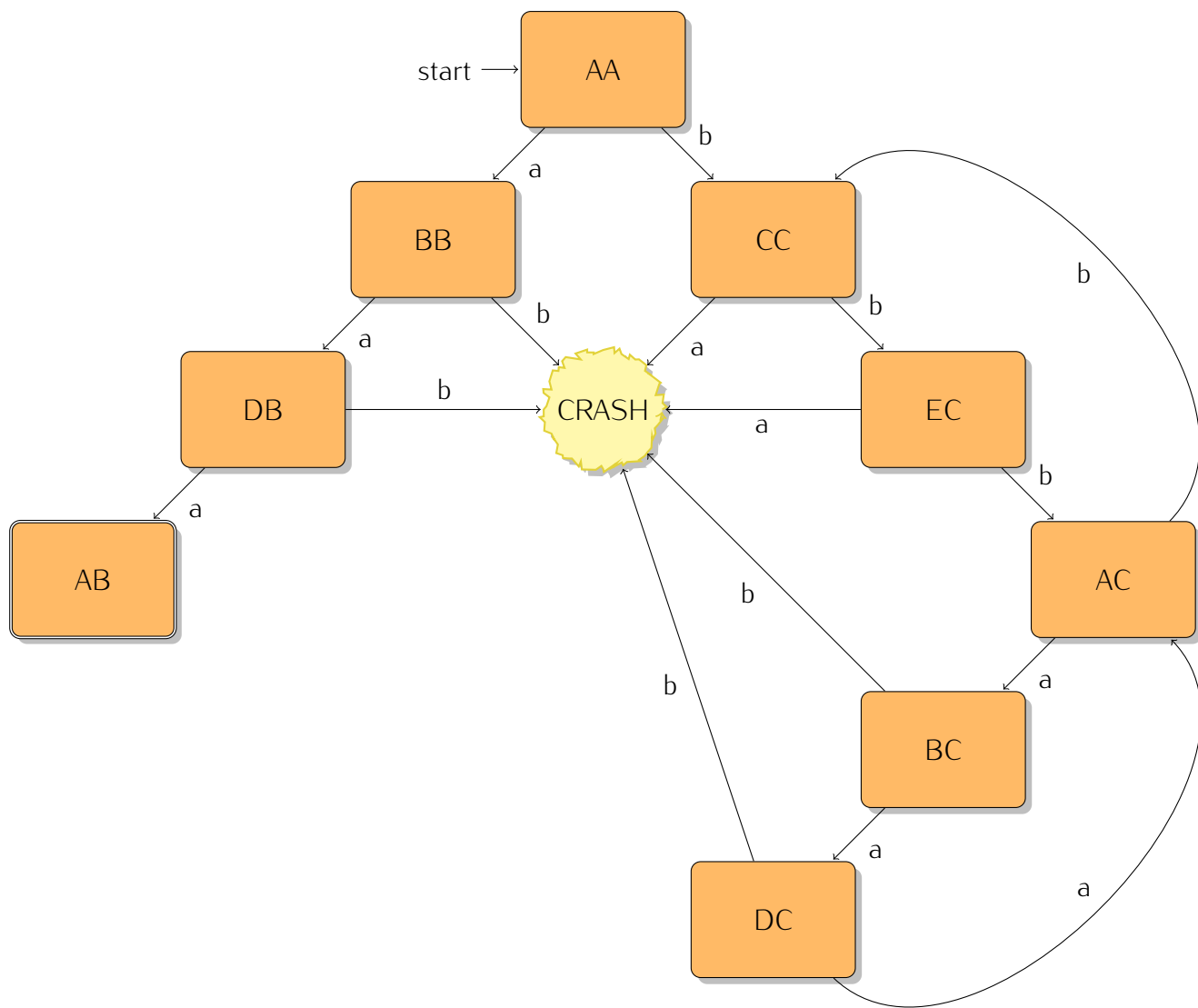
Figure 19: Q05: $L_1 \bigcap L_2$
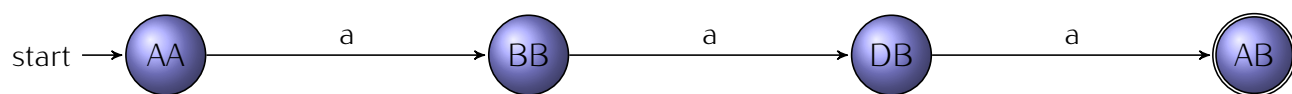

Figure 20: Q05: L_3= aaa
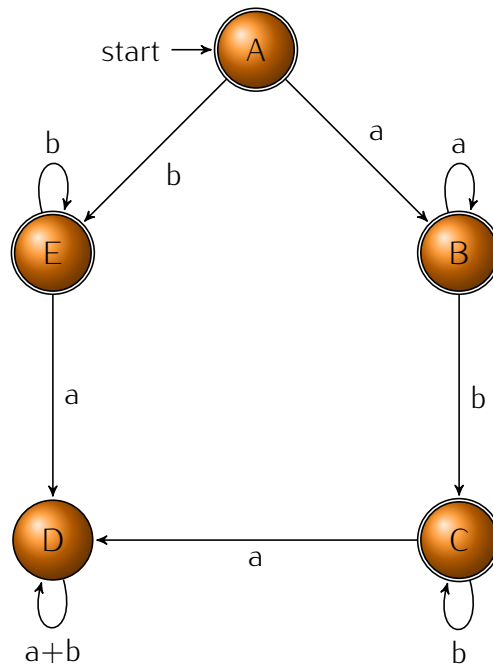
Figure 21: Q06: FA_1
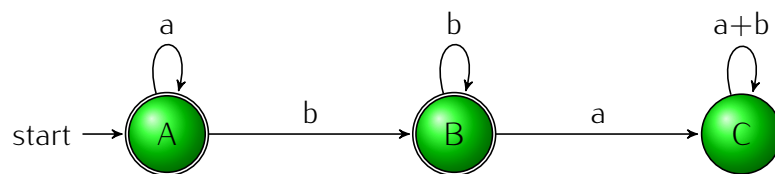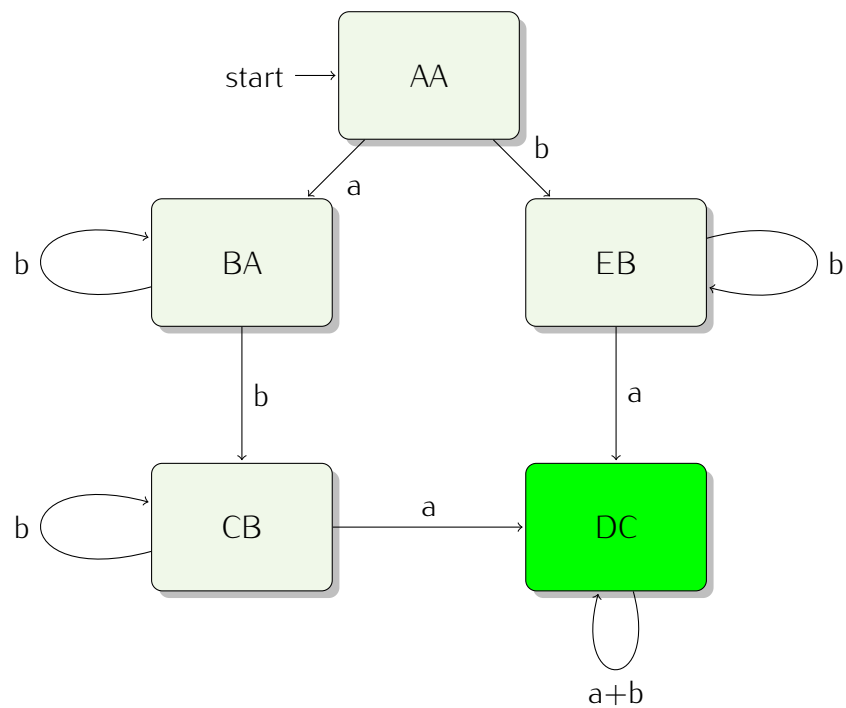

Figure 22: Q06: FA_2

Figure 23: Q06: $L_1 \bigcap L_2$

Acceptable by $L_1 \bigcap L_2$: End States on Both (AA, BA, CB,EB) Non–End state on both (DC)
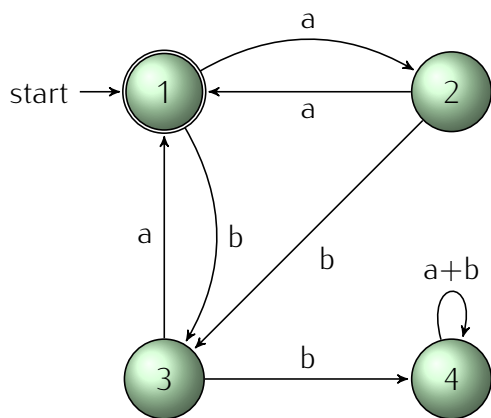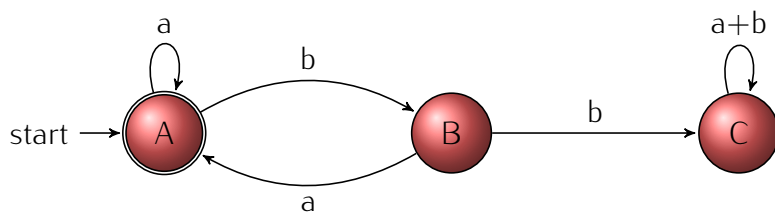
Figure 24: Q07: FA_1

Figure 25: Q07: FA_2

Acceptable by $L_1 \bigcap L_2$: End State on Both (1A) Non-End states on both (3B, 4C)
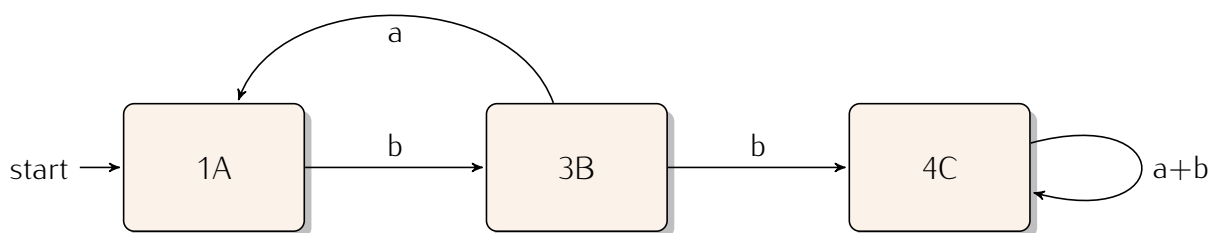
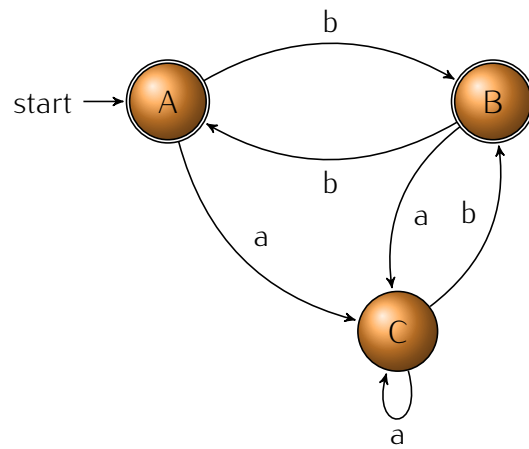Figure 26: Q07

Figure 27: Q08: FA_1
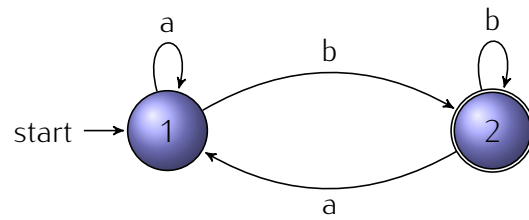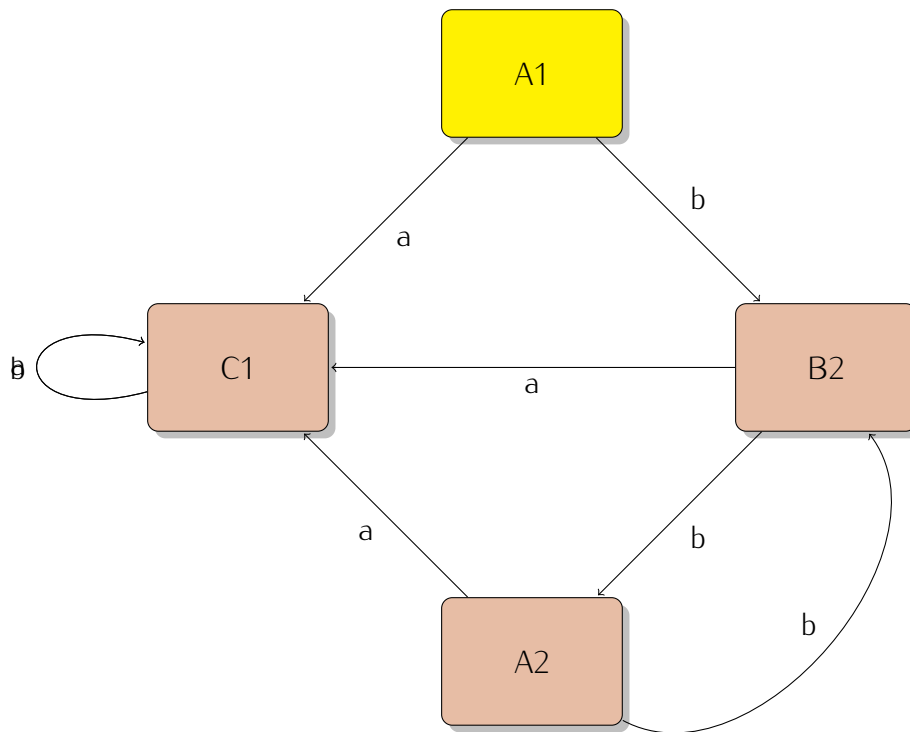

Figure 28: Q08: FA_2

Figure 29: Q08: $L_1 \neq L_2$

Not acceptable by $L_1 \bigcap L_2$: C1
Acceptable by $L_1 \bigcap L_2$: A2, B2
Acceptable by L_1 only: A1, B1
Acceptable by L_2 only: C2
Due to A1: $L_1 \neq L_2$
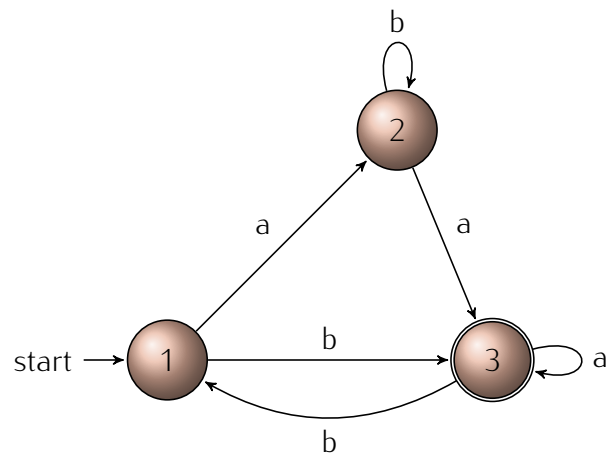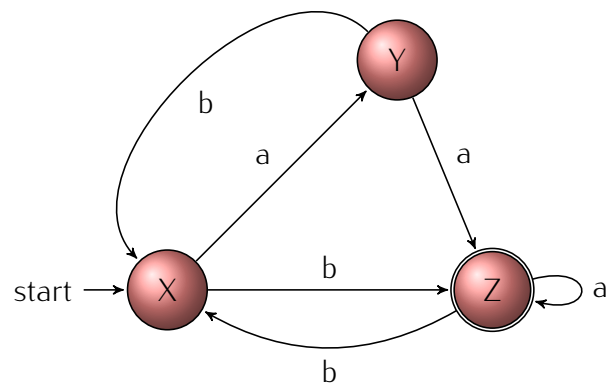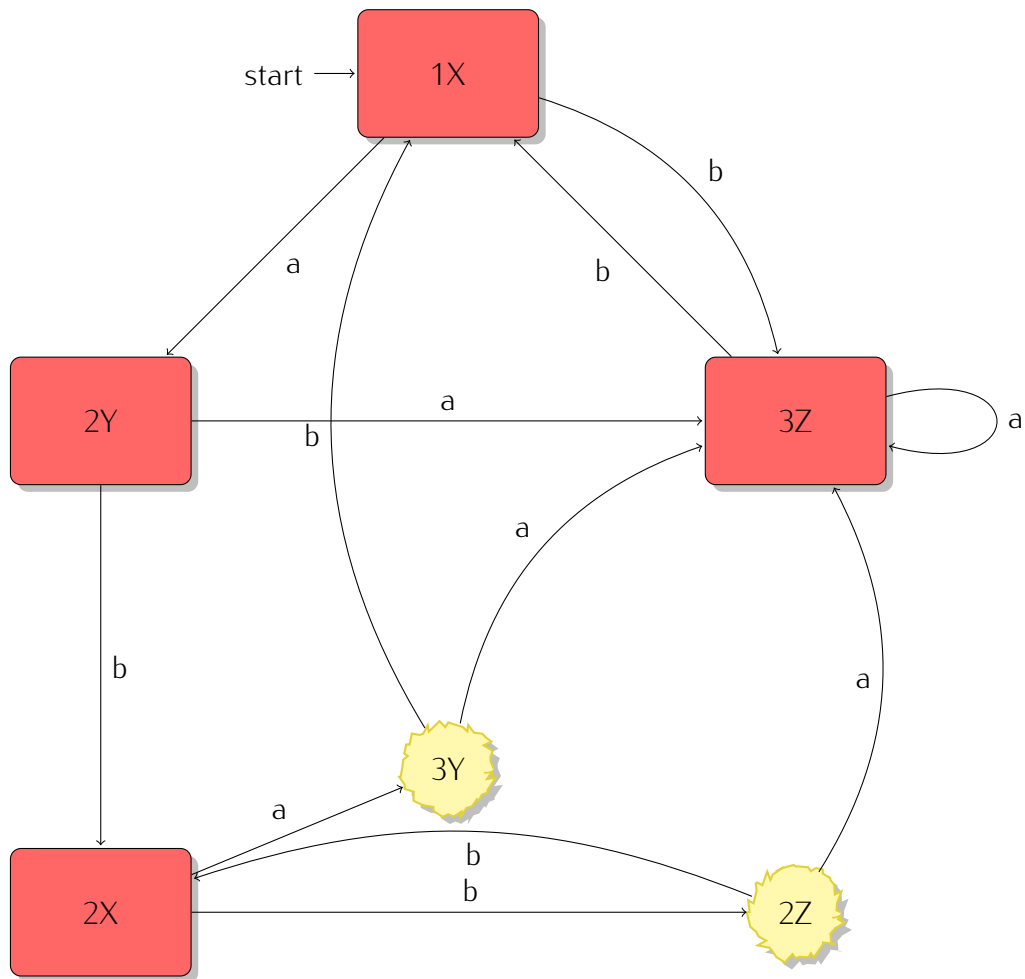
Figure 30: Q09: FA_1

Figure 31: Q09: FA_2

Figure 32: Q09: $L_1 \neq L_2$

Not acceptable by $L_1 \cap L_2$: 1X,1Y,2X,2Y
Acceptable by $L_1 \cap L_2$: 3Z
Acceptable by L_1 only: 3X, 3Y
Acceptable by L_2 only: 1Z, 2Z
Due to 3Y and 2Z: $L_1 \neq L_2$
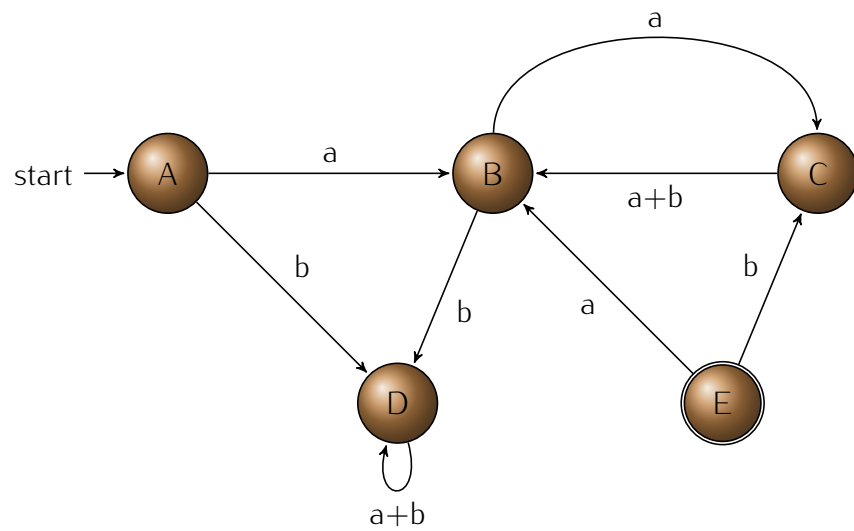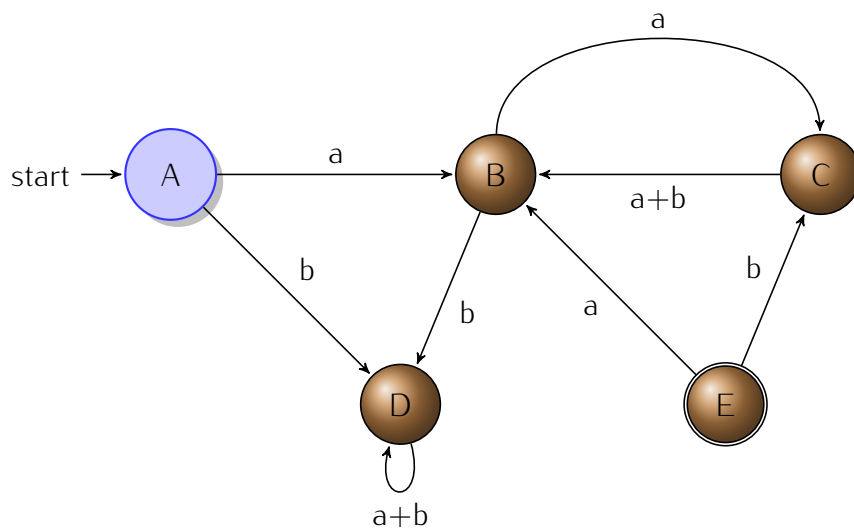
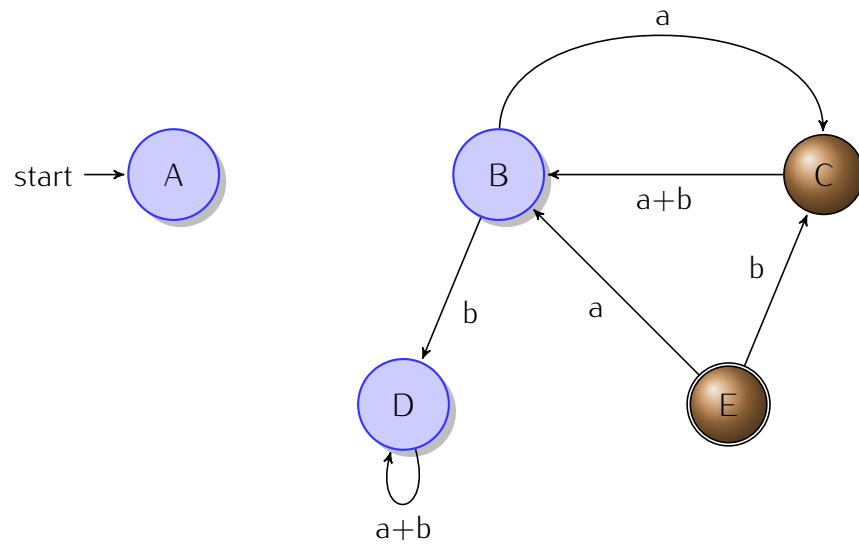**Figure 33:** Q10: Blue Paint

Figure 34: Q10: Step 1

Figure 35: Q10: Step 2

start → A

B, C, D, E states with transitions:
- B → C: a (curved arc above)
- C → B: a+b
- B → D: b
- E → B: a
- E → C: b
- D → D: a+b (self loop)

Figure 36: Q10: Step 3

start → A

B, C, D, E states with transitions:
- C → B: a+b
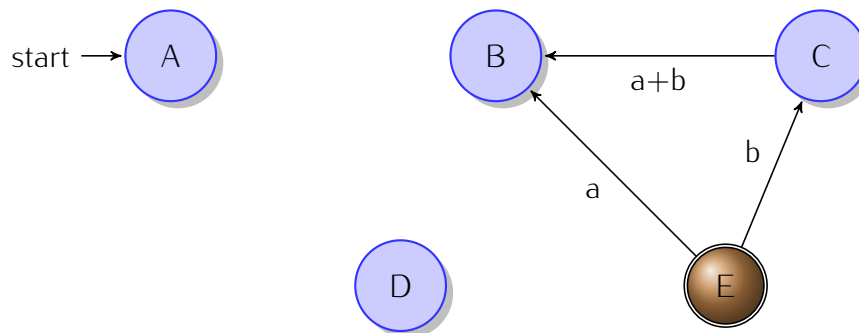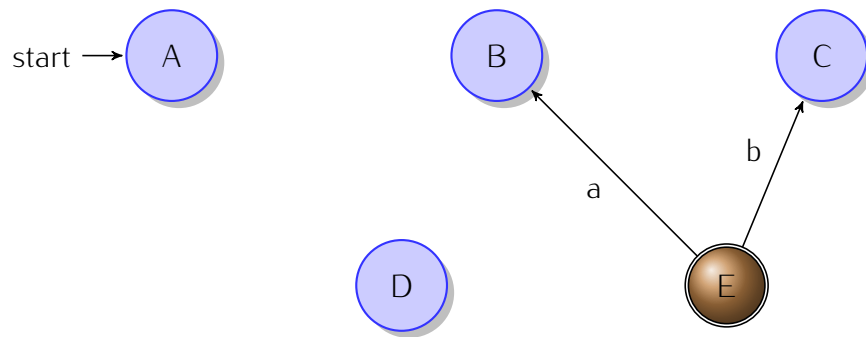- E → B: a
- E → C: b

Figure 37: Q10: Step 4

This machine accepts no words due to the fact that node E remains unpainted and is the only final state.
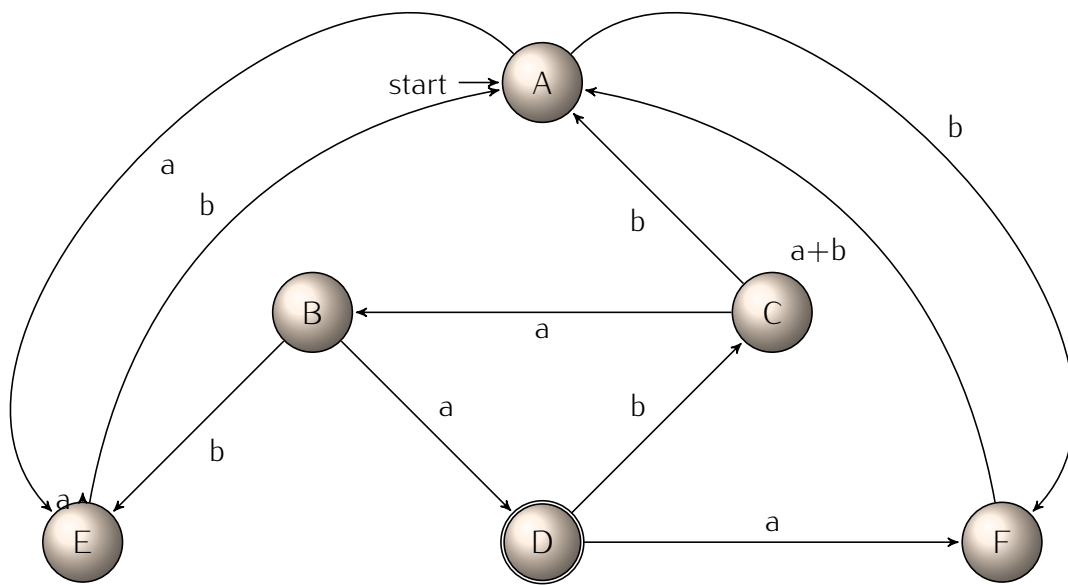
Figure 38: Q11: Blue Paint
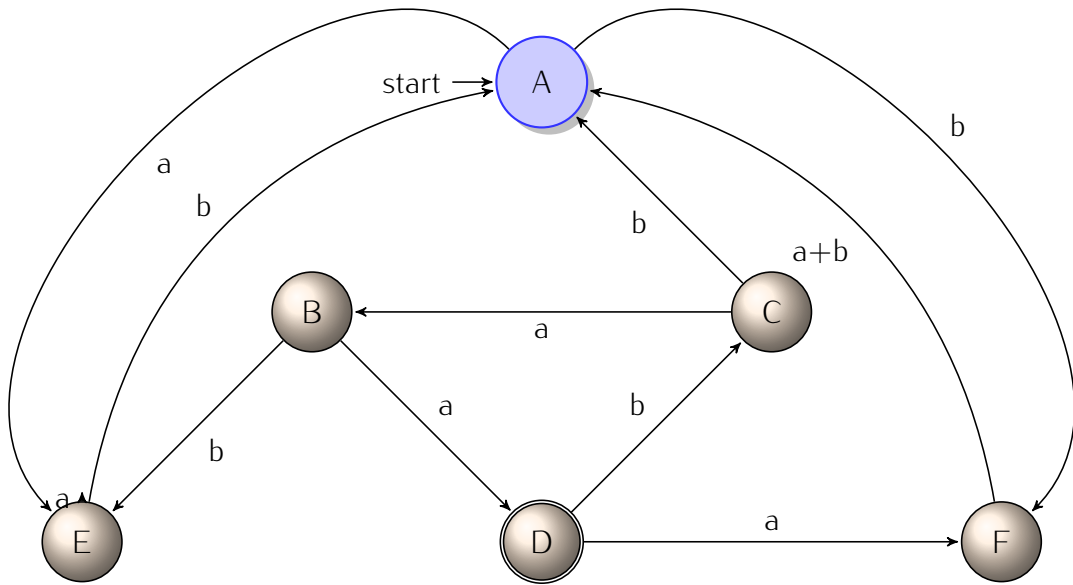
Figure 39: Q11: Step 1
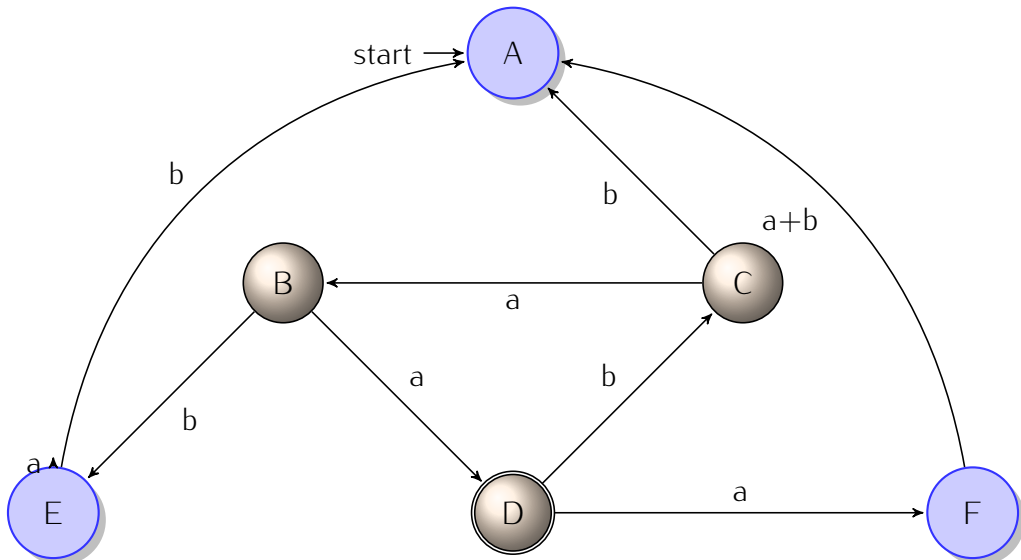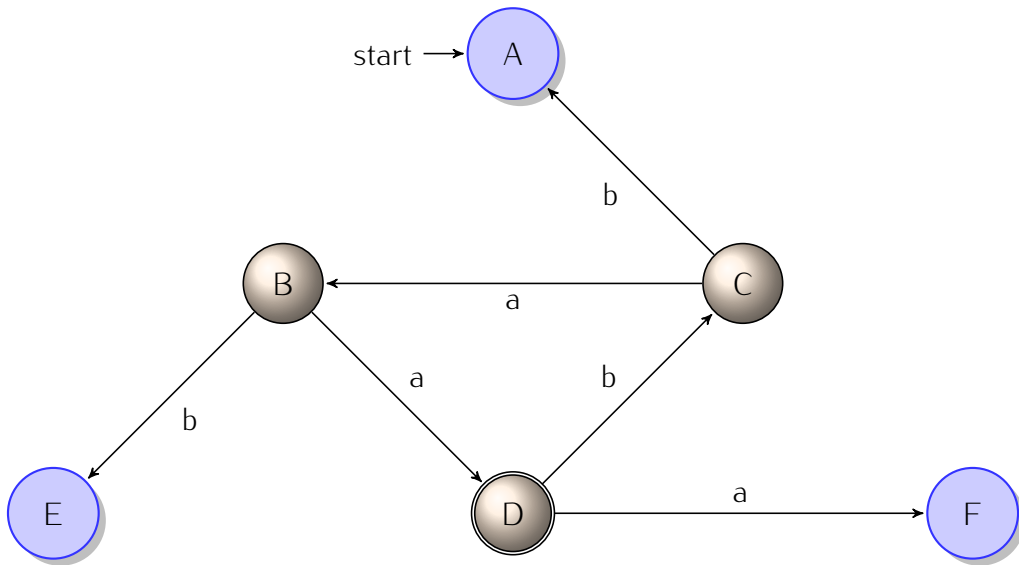

Figure 40: Q11: Step 2

Figure 41: Q11: Step 3

This machine accepts no words due to the fact that node D remains unpainted and is the only final state.