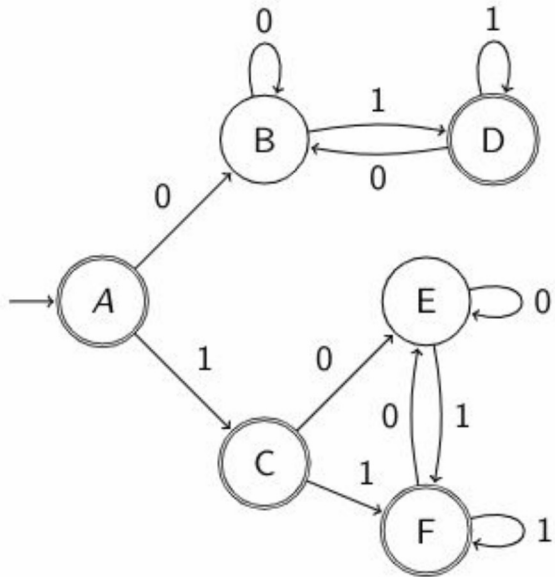
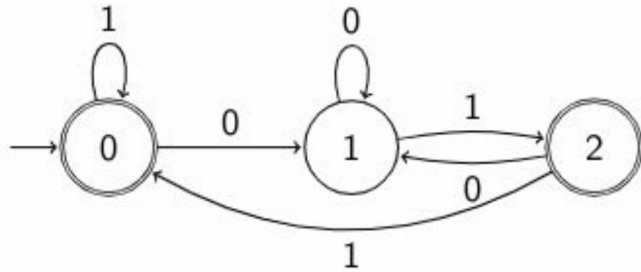


Determine whether the following DFAs are equivalent or not.



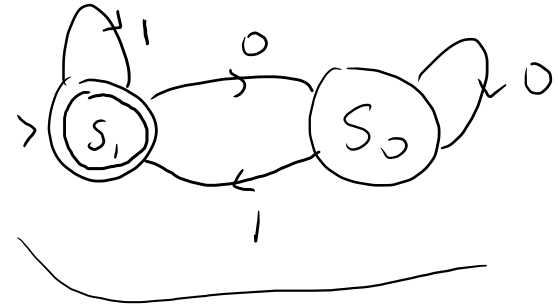
	B	E	1	A	C	D	F	0	2
B	0	0	0	0	0	0	0	0	0
E	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0
A	0	0	0	0	0	0	0	0	0
C	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0

$$S_0 = \{B, E, 1\}$$

$$S_1 = \{A, C, D, F, 0, 2\}$$

Equivalence classes

$$\begin{aligned} \delta(B, 0) &= B, \delta(B, 1) = D \\ \delta(E, 0) &= E, \delta(E, 1) = F \\ \delta(1, 0) &= 1, \delta(1, 1) = 2 \\ \delta(A, 0) &= B, \delta(A, 1) = C \\ \delta(C, 0) &= E, \delta(C, 1) = F \\ \delta(D, 0) &= B, \delta(D, 1) = D \\ \delta(F, 0) &= E, \delta(F, 1) = F \\ \delta(0, 0) &= 1, \delta(0, 1) = D \\ \delta(2, 0) &= 1, \delta(2, 1) = 0 \end{aligned}$$



Construct a CFG for the language  $L = \{w \mid w \text{ is a palindrome of } a \text{ and } b\}$

$$G = (V, T, P, S) \quad , \quad T = \{a, b\} \quad , \quad V = \{a, b, S\}$$

P:

$$S \rightarrow aSa \mid bSb \mid \epsilon \mid a \mid b$$

ababab

$$S \Rightarrow aSa \Rightarrow abSba \Rightarrow ababab$$

Construct a CFG for  $L = \{w \in \{a, b, c\}^* \mid w = a^n b^m c^k, k = m + n\}$ .  $k, m, n \geq 0$

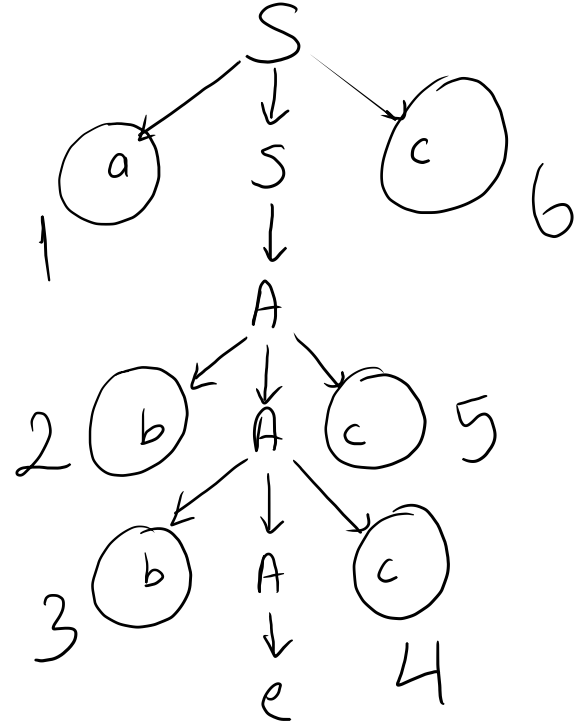
$$G = (V, T, P, S) \quad , \quad T = \{a, b, c\} \quad , \quad V = \{a, b, c, S, A$$

P:

$$S \rightarrow aSc \mid A$$

$$A \rightarrow bAc \mid e$$

Give a parse tree for  
the string  $ab^2c^3$



Construct a CFG for  $L = \{w \in \{a, b, c\}^* \mid w = a^n b^m c^k, k \neq m + n\}$ .

$$G = (V, T, P, S) ; \quad T = \{a, b, c\} , \quad V = \{a, b, c, S, A, X, Y, Z\}$$

$$L = \{ \dots, k > m+n \} \cup \{ \dots, k < m+n \}$$

P:

$$S \rightarrow A \mid Y$$

$$k > m+n \quad \left\{ \begin{array}{l} A \rightarrow aAc \mid Xc \\ X \rightarrow bXc \mid Xc \mid e \end{array} \right.$$

$$k < m+n \quad \left\{ \begin{array}{l} Y \rightarrow aYc \mid aZ \mid bZ \mid aY \\ Z \rightarrow bZc \mid bZ \mid e \end{array} \right.$$