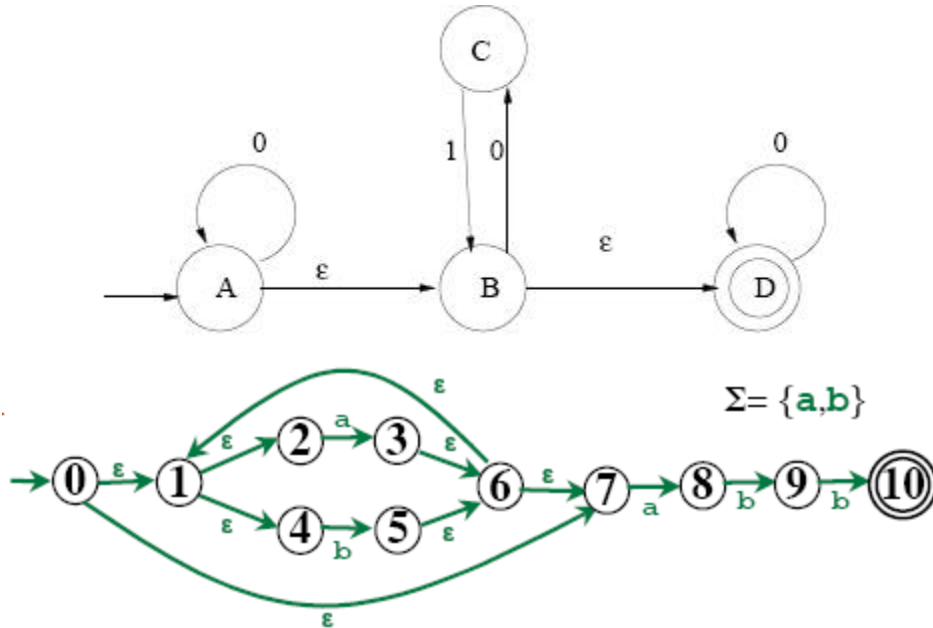
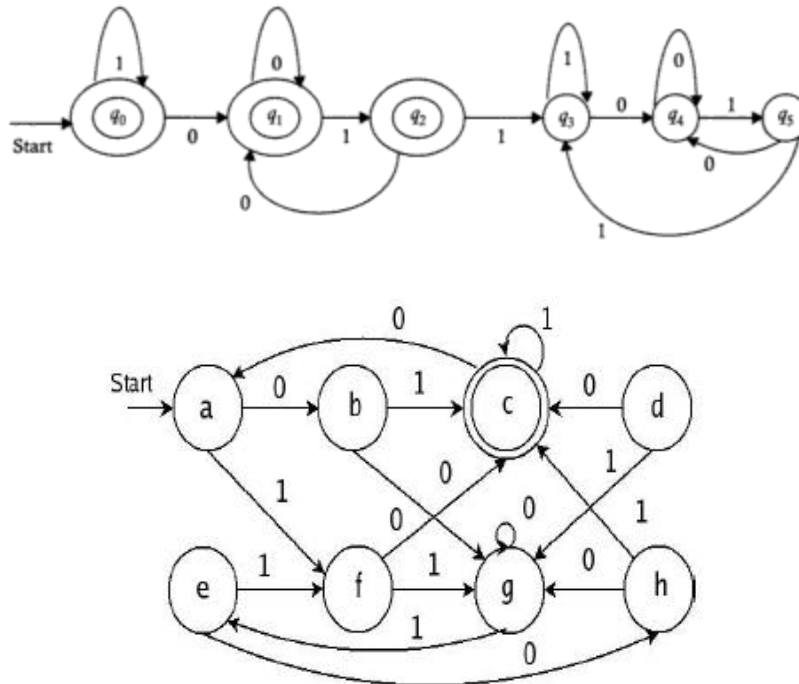


Deterministički i nedeterministički automati, regularni izrazi, gramatike.

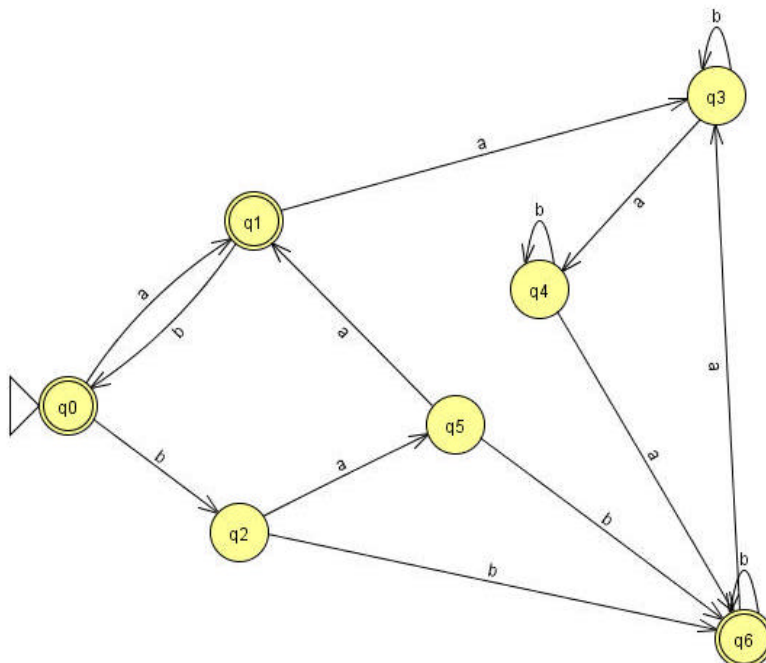
1. Dat je regularni izraz $0^*(01)^*1^* \mid 1(0|1)^*0$. Konstruisati odgovarajući NKA.
2. Transformisati date NKA u DKA primjenom algoritma podskupa.



3. Minimizovati broj stanja datih DKA.



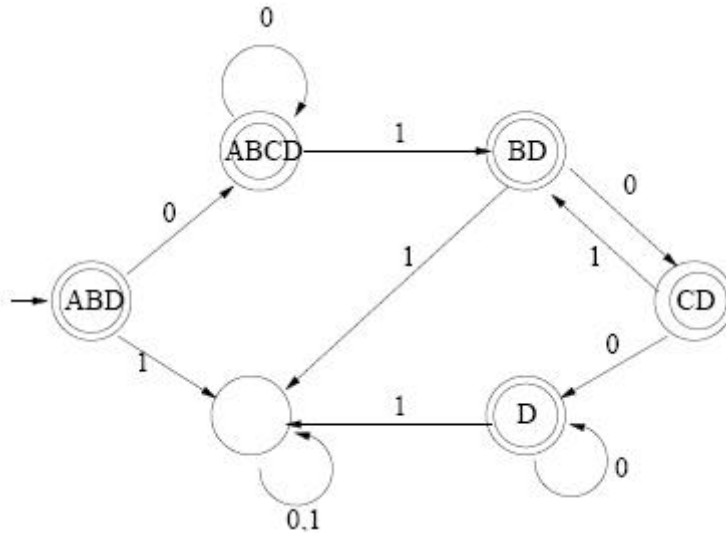
4. Minimizovati broj stanja datog DKA.



5. Regularni izraz za jezik $\{0^i 1^j \mid i \text{ paran, } j \text{ neparan}\}$.
6. DKA i regularni izraz za sve binarne nizove koji ne završavaju sa 01.
7. DKA i regularni izraz za sve binarne stringove koji sadrže podstring 1010.
8. DKA i regularni izraz za sve binarne stringove koji ne sadrže podstring 00 i završavaju jedinicom.
9. DKA nad alfabetom $\{0,1\}$ za sve nizove koji sadrže paran broj nula i paran broj jedinica.
10. DKA za sve ADA identifikatore. Identifikator u jeziku ADA je niz karaktera koji počinje slovom a zatim mogu da slijede slova (letter), cifre (digits) i donja crta (underline). Međutim, identifikator ne može završiti donjom crtom niti imati dvije uzastopne donje crte.
11. DKA za sve binarne stringove koji ne sadrže podstring 011.
12. Napisati regularni izraz i gramatiku za sve binarne nizove koji počinju i završavaju se razlicitim simbolom.
13. Napisati beskontekstne gramatike sa sljedece jezike:
 - a. $L = \{x \in \{0,1\}^* \mid \text{dužina stringa } x \text{ je najmanje } 2 \text{ i simbol na poziciji } i \text{ je isti kao i simbol na poziciji } i+2 \text{ za svako } i\}$
 - b. $L = \{x \in \{0,1\}^* \mid x \text{ nije palindrom}\}$
 - c. $L = \{x \in \{0,1\}^* \mid x \text{ ima jednak broj nula i jedinica}\}$
 - d. $L = \{0^i 1^j 0^k \mid i+k < j\}$

Rješenja:

1. Uradite samostalno.
2. Vidi sliku (za prvi automat).



Drugi automat - postupak:

Start state:

$$\begin{aligned} & \varepsilon\text{-Closure}(0) \\ & = \{0, 1, 2, 4, 7\} = \mathbf{A} \end{aligned}$$

$$\begin{aligned} \text{Move}_{\text{DFA}}(A, a) & \\ & = \varepsilon\text{-Closure}(\text{Move}_{\text{NFA}}(A, a)) \\ & = \varepsilon\text{-Closure}(\{3, 8\}) \\ & = \{1, 2, 3, 4, 6, 7, 8\} = \mathbf{B} \end{aligned}$$

$$\begin{aligned} \text{Move}_{\text{DFA}}(A, b) & \\ & = \varepsilon\text{-Closure}(\text{Move}_{\text{NFA}}(A, b)) \\ & = \varepsilon\text{-Closure}(\{5\}) \\ & = \{1, 2, 4, 5, 6, 7\} = \mathbf{C} \end{aligned}$$

$$\begin{aligned} \text{Move}_{\text{DFA}}(\mathbf{B}, \mathbf{a}) &= \varepsilon\text{-Closure}(\text{Move}_{\text{NFA}}(\mathbf{B}, \mathbf{a})) \\ &= \varepsilon\text{-Closure}(\{3, 8\}) \\ &= \{1, 2, 3, 4, 6, 7, 8\} = \mathbf{B} \end{aligned}$$

$$\begin{aligned} \text{Move}_{\text{DFA}}(\mathbf{B}, \mathbf{b}) &= \varepsilon\text{-Closure}(\text{Move}_{\text{NFA}}(\mathbf{B}, \mathbf{b})) \\ &= \varepsilon\text{-Closure}(\{5, 9\}) \\ &= \{1, 2, 4, 5, 6, 7, 9\} = \mathbf{D} \end{aligned}$$

Process $\mathbf{C} = \{1, 2, 4, 5, 6, 7\}$

$$\begin{aligned} \text{Move}_{\text{DFA}}(\mathbf{C}, \mathbf{a}) &= \{1, 2, 3, 4, 6, 7, 8\} = \mathbf{B} \\ \text{Move}_{\text{DFA}}(\mathbf{C}, \mathbf{b}) &= \{1, 2, 4, 5, 6, 7\} = \mathbf{C} \end{aligned}$$

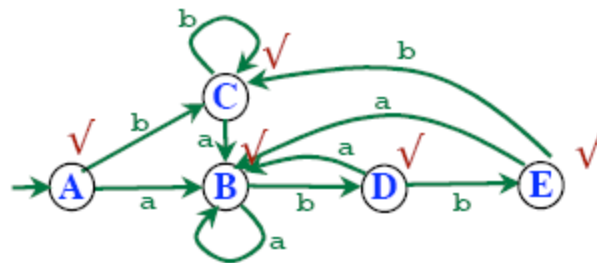
Process $\mathbf{D} = \{1, 2, 4, 5, 6, 7, 9\}$

$$\begin{aligned} \text{Move}_{\text{DFA}}(\mathbf{D}, \mathbf{a}) &= \{1, 2, 3, 4, 6, 7, 8\} = \mathbf{B} \\ \text{Move}_{\text{DFA}}(\mathbf{D}, \mathbf{b}) &= \{1, 2, 4, 5, 6, 7, 10\} = \mathbf{E} \end{aligned}$$

Process $\mathbf{E} = \{1, 2, 4, 5, 6, 7, 10\}$

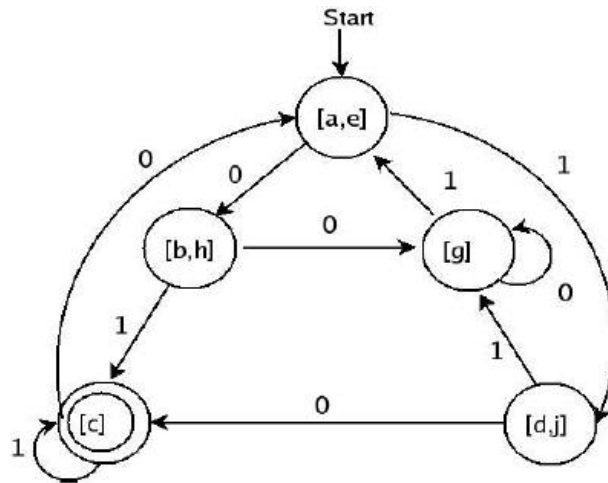
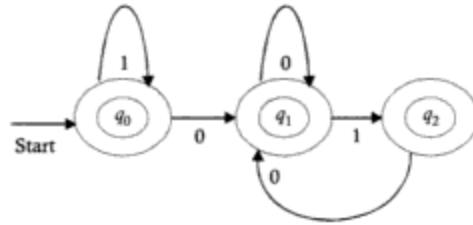
$$\begin{aligned} \text{Move}_{\text{DFA}}(\mathbf{E}, \mathbf{a}) &= \{1, 2, 3, 4, 6, 7, 8\} = \mathbf{B} \\ \text{Move}_{\text{DFA}}(\mathbf{E}, \mathbf{b}) &= \{1, 2, 4, 5, 6, 7\} = \mathbf{C} \end{aligned}$$

Dobijeni DKA:

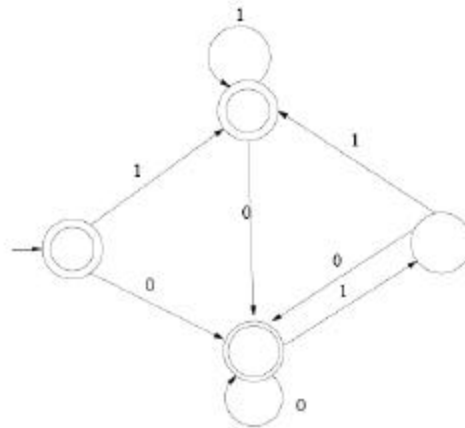


Još jedan primjer transformacije NKA u DKA možete naci na <http://condor.depaul.edu/~glancast/444class/docs/nfa2dfa.html>.

3. Vidi sliku:

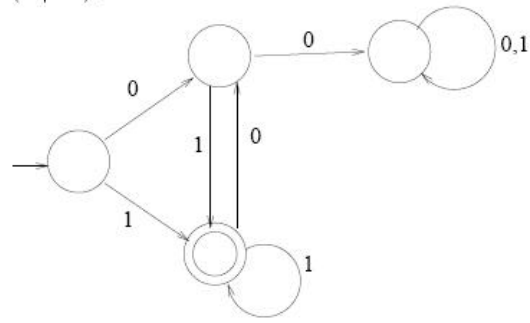


4. Dati automat je optimalan.
5. $(00)^*1(11)^*$
6. $\varepsilon \mid 0 \mid 1 \mid (0 \mid 1)^*(11 \mid 00 \mid 10)$

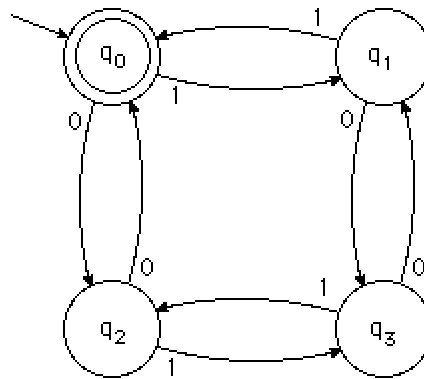


7. $(0 \mid 1)^*1010(0 \mid 1)^*$. Automat nacrtajte sami.
8. Vidi sliku:

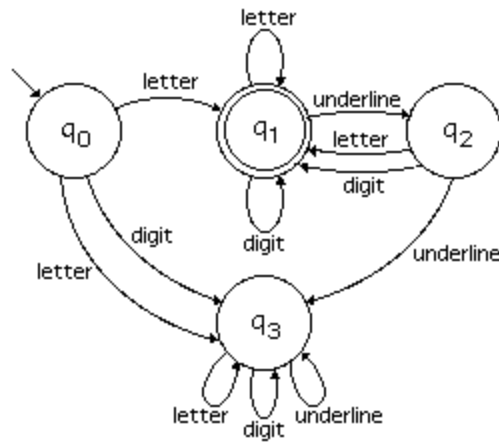
$(1 | 01)^+$



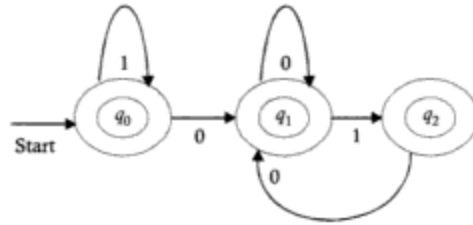
9. Vidi sliku:



10. Vidi sliku:



11. Vidi sliku:



12. Regularni izraz: $0(0 | 1)^*1 | 1(0 | 1)^*0$. Gramatika: $S \rightarrow 0A1 | 1A0$, $A \rightarrow 1A | 0A | \epsilon$
 13.

- $S \rightarrow A | B | C | D$, $A \rightarrow 00A | 00$, $B \rightarrow 11B | 11$, $C \rightarrow 10C | 10$, $D \rightarrow 01D | 01$
- $S \rightarrow 0S0 | 1S1 | A$, $A \rightarrow 1B0 | 0B1$, $B \rightarrow 1B | 0B | \epsilon$
- $S \rightarrow 1S0S | 0S1S | \epsilon$
- $S \rightarrow ABC$, $A \rightarrow 0A1 | \epsilon$, $B \rightarrow 1B | 1$, $C \rightarrow 1C0 | \epsilon$