Automata Theory and Formal Language
Lab Session 4

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1 Exercise

Given the RE $E = (((00)* + (00)*0)10 + ((11)* + (11)*1)10)*$

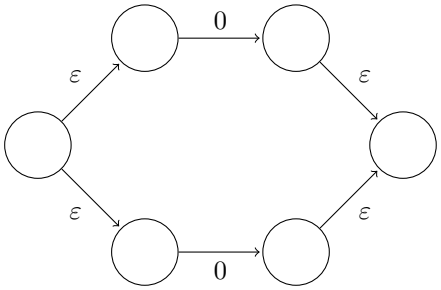
1. Build a $\mathcal{E}-NFA$ thats accepts exactly the same language, following the method explained in class to convert from RE to $\mathcal{E}-NFA$.
2. Generate the equivalent DFA
3. Implement it in a programming language (`Python`, `C/C++`, `Java`) following the table method.

2 Solution

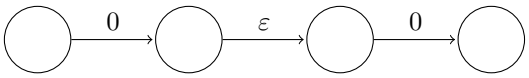
1. Build a $\mathcal{E}-NFA$ thats accepts exactly the same language, following the method explained in class to convert from RE to $\mathcal{E}-NFA$.

   To convert a ER to an $\mathcal{E}-NFA$ we'll follow the following equivalences:

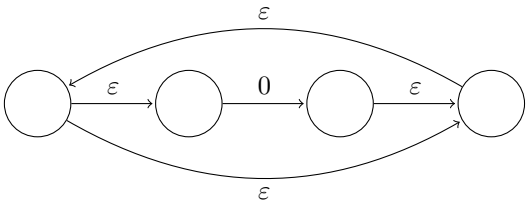
   - Union.
     If $E1 = 0$ and $E2 = 0$ then $E1 \cup E2$ $(E1 + E2)$:



   - Concatenation.
     If $E1 = 0$ and $E2 = 0$ then $E1E2$:



   - Concatenation.
     If $E = 0$ then $E*$:



We'll divide the main ER into smaller ERs:

$$E = ((((00)* + (00)*0)10 + ((11)* + (11)*1)10)*$$

$E1$ $E1$ $E2$ $E2$

$E1*$ $E1*$ $E2*$ $E2*$

$E3$ $E4$

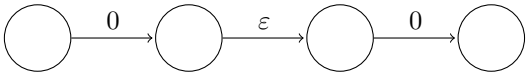
$E5$ $E6$

$E7$ $E8$

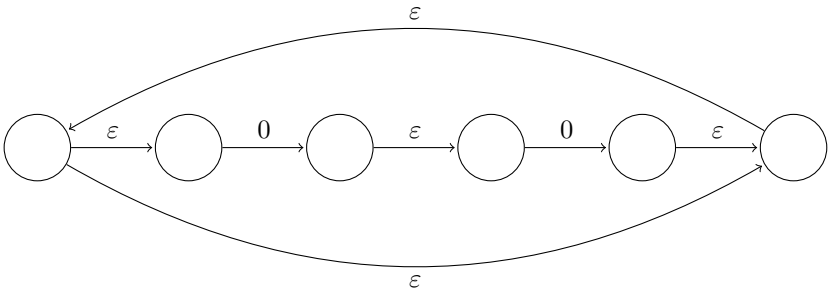
$E9$

$E9*{=}E$

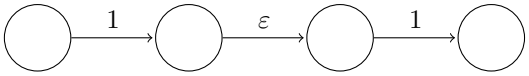
- $E1 = 00$



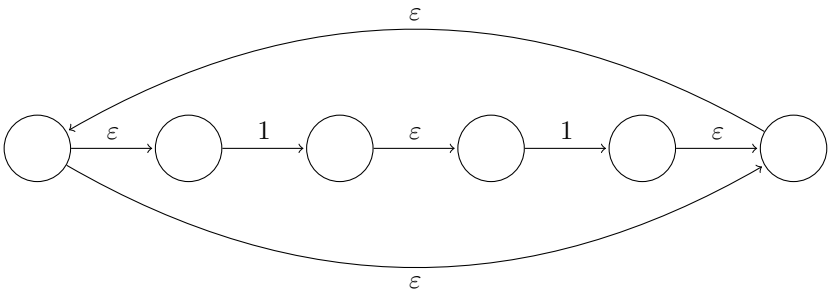
- $E1* = (00)*$



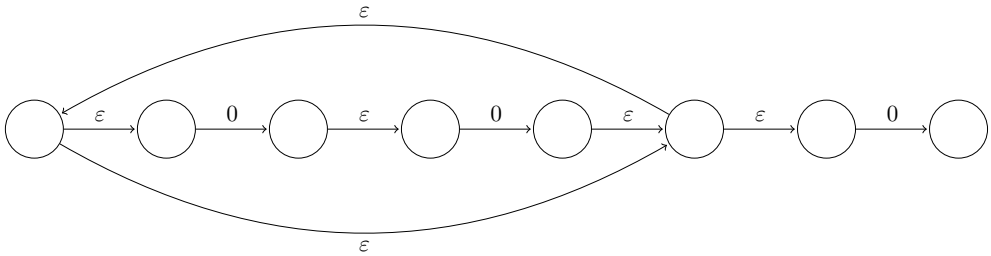
- $E2 = 11$



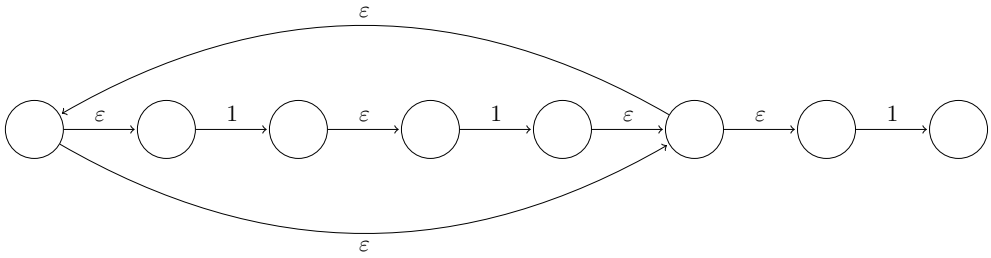
- $E2* = (11)*$



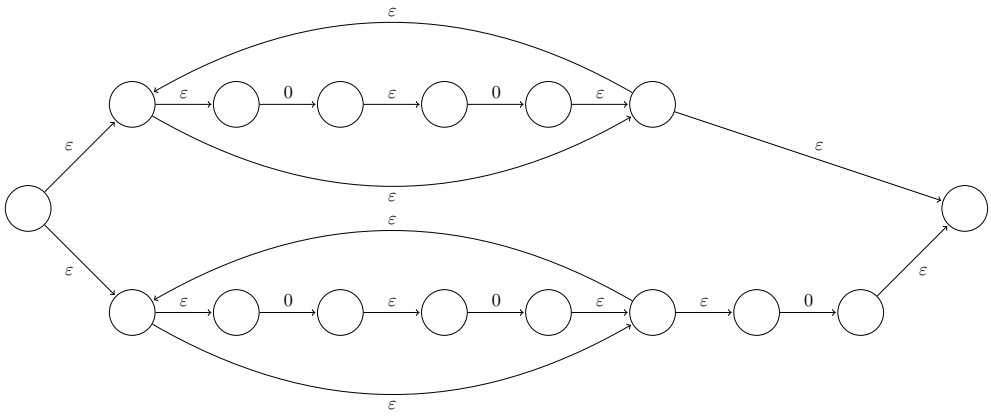
- $E3 = (00) * 0$



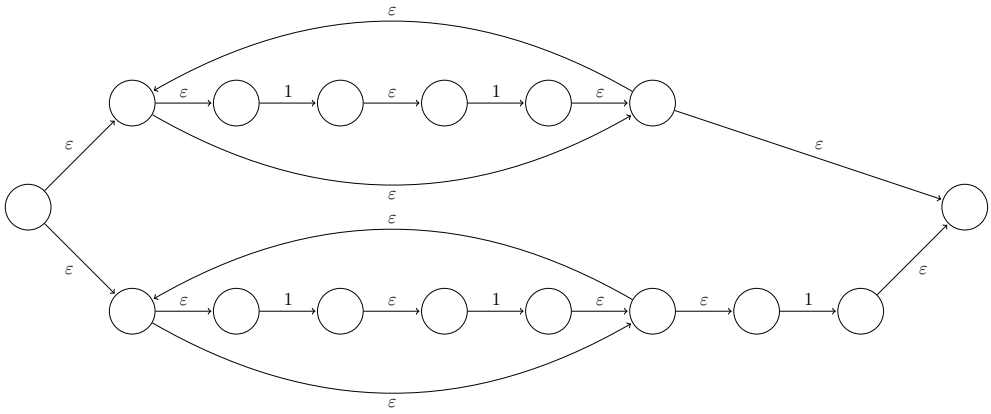
- $E4 = (11) * 1$



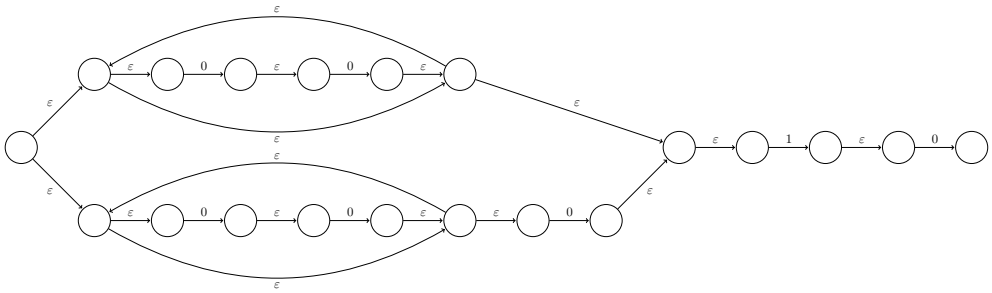
- $E5 = (00) * + (00) * 0$



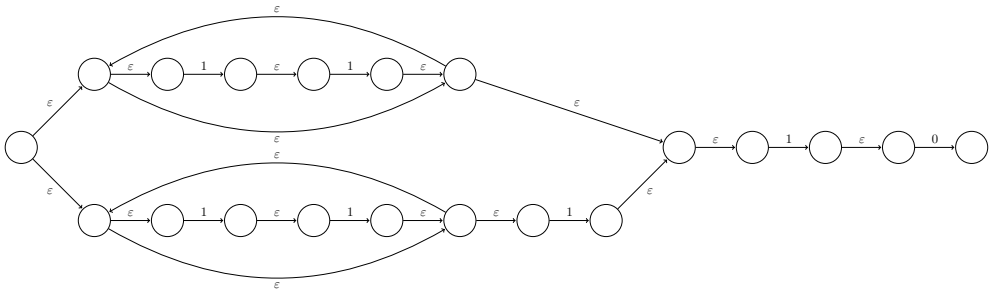
- $E6 = (11) * + (11) * 1$



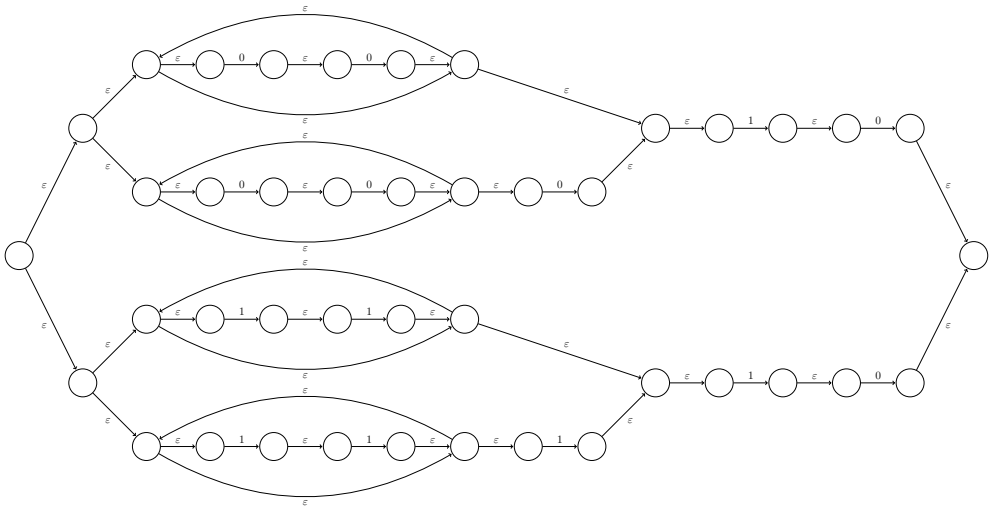
- $E7 = ((00)* + (00)*0)10$



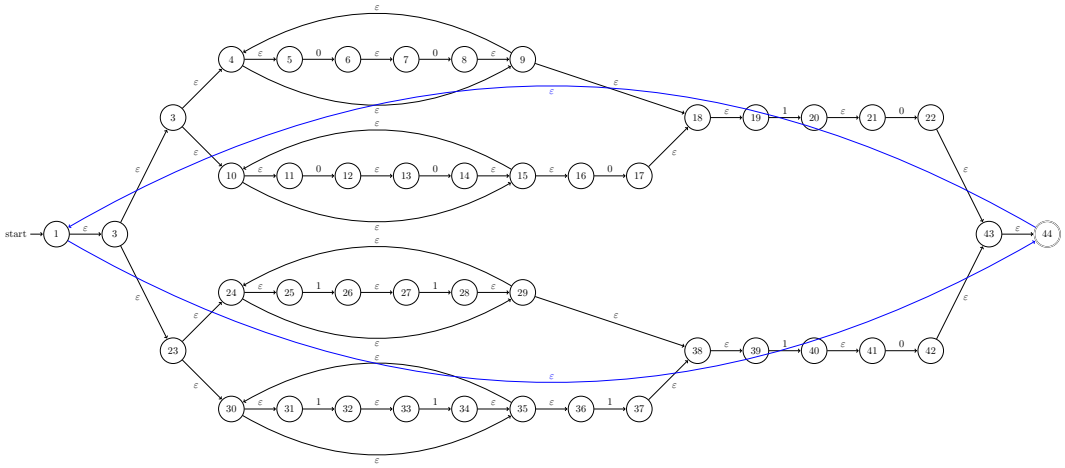
- $E8 = ((11)* + (11)*1)10$



- $E9 = (((00)* + (00)*0)10 + ((11)* + (11)*1)10)$



- $E9* = (((00)* + (00)*0)10 + ((11)* + (11)*1)10)* = E$



2. Generate the equivalent DFA

   Solution 2.

3. Implement it in a programming language (`Python`, `C`/`C++`, `Java`) following the table method.

   Solution 3.