

Eksaminatorier DM534 Uge 44/45

Husk principperne for timerne i opgaveregning i DM534: Opgaverne i gruppe I løser man i timerne med opgaveregning, sammen med de andre i sin studiegruppe. Disse opgaver skal altså *ikke* løses på forhånd, og man skal blot have læst på stoffet fra forelæsningsen inden timen i opgaveregning. Opgaverne i gruppe II løser man hjemme, sammen med sin studiegruppe, inden de næste øvelsестimer i ugen efter (her uge 45).

Husk at læse de relevante sider i slides før du/I forsøger at løse en opgave.

I: Løses i løbet af øvelsестimerne i uge 44

Start med at repetere følgende definitioner fra slides:

- En Deterministic Finite Automaton (DFA).
- At en DFA accepterer en streng.
- Sproget bestemt af en DFA.
- En Context-Free Grammar (CFG).
- At en CFG udleder (derives) en streng.
- Sproget bestemt af en CFG.

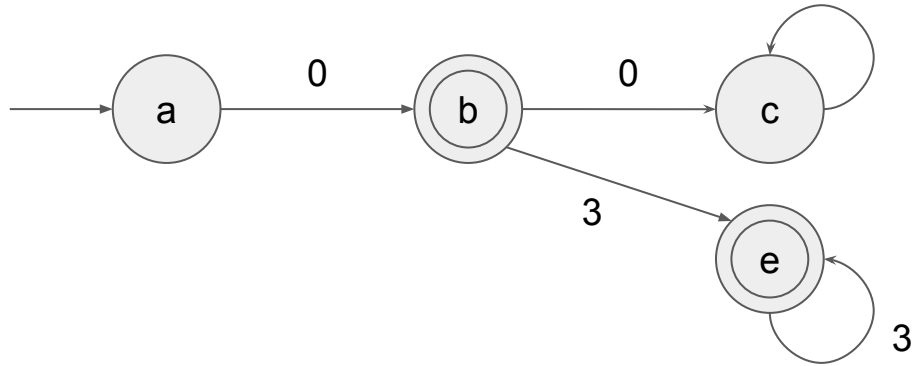
Lav derefter opgave 1–8 på de følgende sider.

II: Løses hjemme inden øvelsестimerne i uge 45

Lav opgave 9–11 på de følgende sider.

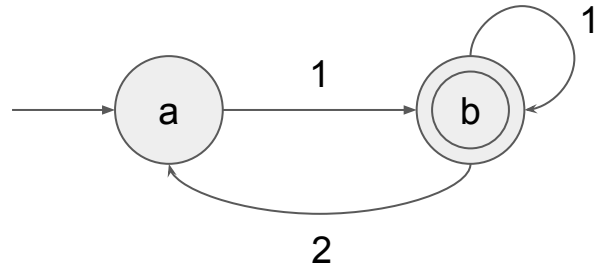
Exercise 1

- What is the language of the following DFA?



Exercise 2

- What is the language of the following DFA?



Exercise 3

- Define a DFA that recognises the following language:
 - All strings of 0s and 1s that contain an odd number of 1s and any number of 0s.

Exercise 4

- Define a DFA that recognises the following language:
 - All strings of 0s and 1s that contain the string 010.

Exercise 5

- Define a DFA that recognises the following language:
 - All strings of 0s and 1s that contain at least two occurrences of 10 and an even number of 0s.

Exercise 6

- What is the language of the following CFG?

$$S \rightarrow ab$$
$$S \rightarrow SS$$

Exercise 7

- Write two different derivations for the string 0001111 with the following CFG. (Same end result, but some different intermediate steps.)

$$S \rightarrow 0M1$$

$$M \rightarrow M1$$

$$M \rightarrow 0M$$

$$M \rightarrow 0$$

$$M \rightarrow 1$$

Exercise 8

- What is the language of the following CFG?

$$S \rightarrow 0MM1$$

$$M \rightarrow 0M$$

$$M \rightarrow 1M$$

$$M \rightarrow 0$$

$$M \rightarrow 1$$

Exercise 9

- Define a CFG that recognises the following language:
 - All strings of 0s and 1s consisting of n 0s followed by n 1s.
 - Examples: 0011 is OK, 1100 is not OK, 011 is not OK.

Exercise 10

- Define a DFA that recognises the same language of this CFG:

$$S \rightarrow 0M$$

$$S \rightarrow 1$$

$$M \rightarrow 0S$$

$$M \rightarrow 1T$$

$$T \rightarrow 0M$$

$$T \rightarrow 1T$$

Exercise 11

- Define a CFG that recognises the following language:
 - All strings of arithmetic additions that contain numbers, the + sign, and (balanced) parentheses.
 - Examples: $(0+1)$ is OK, $(2+(3))+4$ is OK, $2+3(2)$ is not OK.