

Opgaver DM534 uge 39

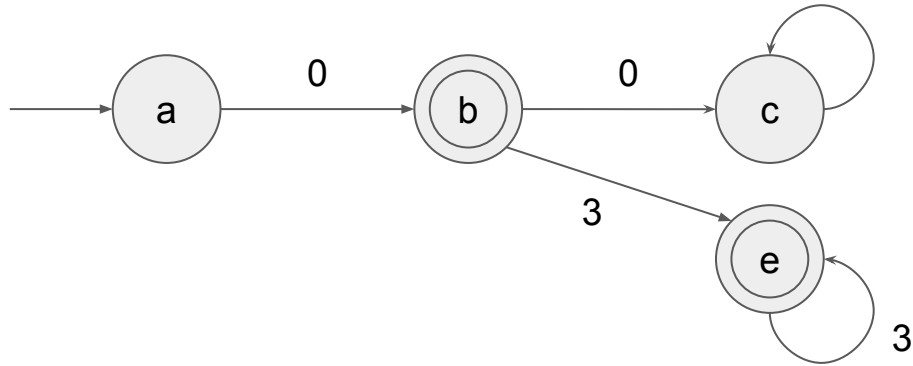
Studiegrupperne handler om at bruge hinanden til at arbejde med stoffet og sammen forsøge at løse ugens opgaver inden eksaminatorietimerne. Man kan f.eks. aftale at arbejde med ca. halvdelen af opgaverne individuelt inden studiegruppetimen. Når man mødes kan man så sammenligne både opnåede svar og ens problemer undervejs, og derefter arbejde med resten af opgaverne sammen. Man kan derudover starte med at repetere følgende definitioner fra slides for hinanden:

- 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.

Opgaverne til eksaminatorietimerne står på de følgende sider.

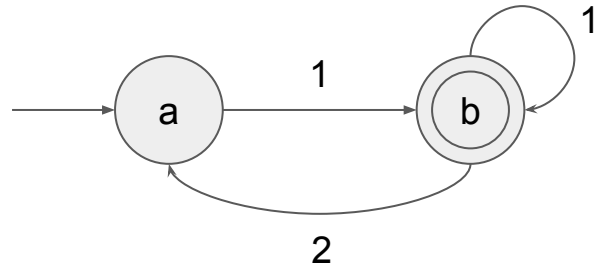
Exercise 1

- 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.