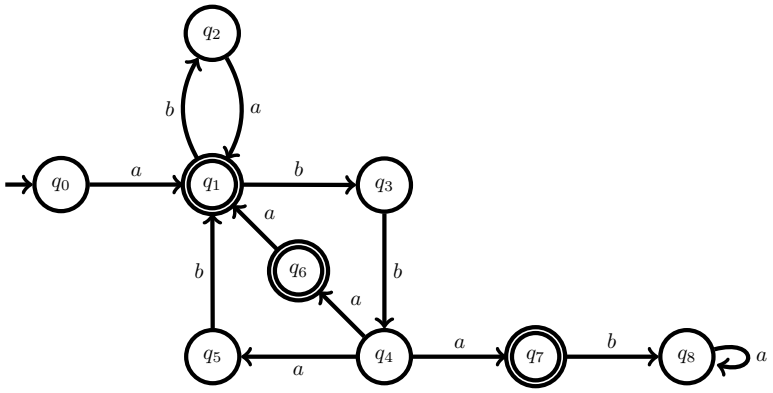
Technische Universität München **Winter term 2017/18**
I7
Prof. J. Esparza / Dr. M. Blondin **21.01.2018**

Automata and Formal Languages — Homework 13

Due 30.01.2018

Exercise 13.1
Let B be the following Büchi automaton:



(a) Execute the emptiness algorithm *NestedDFS* on B.

(b) Recall that *NestedDFS* is a non deterministic algorithm and different choices of runs may return different lassos. Which lassos of B can be found by *NestedDFS*?

(c) Show that *NestedDFS* is non optimal by exhibiting some search sequence on B.

(d) Execute the emptiness algorithm *TwoStack* on B.

(e) Which lassos of B can be found by *TwoStack*?

Exercise 13.2
Prove or disprove:

(a) $\mathbf{GF}(\varphi \vee \psi) \equiv \mathbf{GF}\varphi \vee \mathbf{GF}\psi$

(b) $\mathbf{GF}(\varphi \wedge \psi) \equiv \mathbf{GF}\varphi \wedge \mathbf{GF}\psi$

(c) $(\varphi \vee \psi)\ \mathbf{U}\ \rho \equiv (\varphi\ \mathbf{U}\ \rho) \vee (\psi\ \mathbf{U}\ \rho)$

(d) $\rho\ \mathbf{U}\ (\varphi \vee \psi) \equiv (\rho\ \mathbf{U}\ \varphi) \vee (\rho\ \mathbf{U}\ \psi)$

Exercise 13.3
Let AP $= \{p, q, r\}$. Give formulas for the computations satisfying the following properties:

(a) if q eventually holds, then p may not hold before q first do

(b) if q eventually holds, then p holds before q first holds

(c) p always holds between q and r.

(d) p, and only p, holds at even positions and q, and only q, holds at odd positions.