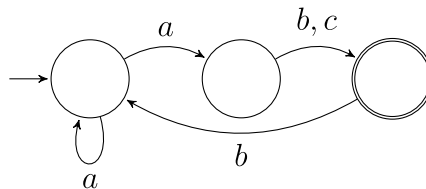


CONCORDIA UNIVERSITY  
Dept. of Computer Science and Software Engineering  
COMP 335 – Introduction to Theoretical Computer Science  
Fall 2023

Assignment 2

Submission through moodle is due by Sunday, October 1st at 23:59

1. [14 Points] Design a DFA for the language  $L = \{a^n b^2 : n > 0\} \cup \{b^n ab : n \geq 0\}$ .
2. [14 Points] Show that  $L = \{waw^R : w \in (ab)^*\}$  is regular.
3. [18 Points] Let  $L$  be a language over  $\Sigma = \{0, 1, 2\}$  where each 0 is followed by a 1 or 22.
  - (a) Give a regular grammar that generates  $L$ .
  - (b) Convert the regular grammar into an NFA.
  - (c) Give a regular expression for  $L$ .
4. [18 Points] Let  $L = \{w \in (a + b)^* : n_a(w) \text{ is even , } n_b(w) \geq 2\}$ .
  - (a) Give a DFA  $M$  that accepts that accepts  $L$ .
  - (b) Convert  $M$  into a regular grammar for  $L$ .
  - (c) Give a regular expression for  $L$ .
5. [18 Points] Let RE =  $(01 + 10)((1^*0)^* + (0^*1^*)^*)^*$ .
  - (a) Convert the above RE to an NFA  $M$  using the procedure described in class.
  - (b) Convert  $M$  to a DFA  $M'$ .
  - (c) Minimize  $M'$ .
6. [18 Points] Take the following FA  $M$ :



- (a) Give a regular expression for  $L(M)$ , the language accepted by  $M$ .
- (b) Give a right-linear grammar for  $L(M)$ .
- (c) Give a left-linear grammar for  $L(M)$ .