

**CS 3133 Foundations of Computer Science**  
**C term 2018**

**(Last) Homework 5, due Monday, February 26**

READING: Chapters 7, 8, 14, 15, 16.

1. Exercise 17.b. on page 249. (20 points)
2. Let  $M$  be the Turing machine defined by

$\delta$	B	a	b	c
$q_0$	$(q_0, B, R)$	$(q_0, a, R)$	$(q_0, b, R)$	$(q_1, c, L)$
$q_1$	$(q_2, B, R)$	$(q_1, b, L)$	$(q_1, a, L)$	-
$q_2$	-	-	-	-

- (a) Trace the computation for the input string  $abcb$ .
- (b) Trace the first six transitions of the computation for the input string  $abab$ .
- (c) Give the state diagram of  $M$  and describe the result of a computation in  $M$ .

(20 points)

3. Construct a Turing machine with input alphabet  $\{a, b, c\}$  that accepts strings in which the first  $c$  is immediately preceeded by the substring  $aaa$ . A string must contain a  $c$  to be accepted by the machine. (20 points)
4. Construct a Turing machine with input alphabet  $\{a, b, c\}$  that accepts the language  $L = \{a^i b^i c^i \mid i \geq 0\}$  by halting only. (20 points)
5. Construct a standard Turing machine that accepts the set of palindromes over  $\{a, b\}$ . (20 points)